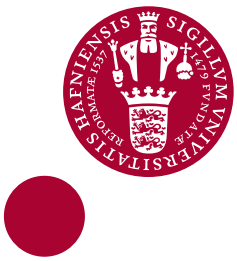

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Preface

Improved Seed Supply for Agroforestry in African Countries (ISSAAC) is a Danida funded project hosted by ICRAF. It develops strategies and procedures to match agroforestry tree seed supply demands in Burkina Faso, Malawi and Uganda. The ISSAAC project runs from 2001-2010 and is a collaboration between the World Agroforestry Centre (ICRAF), *Forest & Landscape Denmark* (FLD) and national institutions in the three countries.

This report has been prepared by Centre National de Semences Forestières (CNSF) in Burkina Faso, FLD and ICRAF. The survey reported here deals with Burkina Faso and is one of several national surveys designed to explore, benchmark and analyse the present tree seed supply situation in the three countries. It was carried out as the initial survey for ISSAAC in year 2002.

The report entails methods and findings from the survey, and it aims at illustrating tree seed distribution and disbursement as it exists in Burkina Faso. Further, it identifies farmers' preferences and problems related to seed, and the findings are eventually to be used to design test-projects for improved seed distribution systems.

Dedication

This document is dedicated to the memory of our friend BALIMA Raymond, who was a member of the research team.

ISSAAC

ISSAAC's objectives are to develop stronger and better seed systems that will enable small-scale land users to capture the benefits of utilising agroforestry systems for increased food security and increased income from sale of products produced on farm. Other organisations and institutions in Africa also develop technologies to improve the livelihoods of small-scale land users. A major bottleneck for dissemination and appliance of these technologies is lack of seed and other reproductive material. The traditional providers of reproductive material of trees and shrubs in Africa are not developed for decentralised production and supply that can meet the potential demand from millions of farmers. Many organisations and institutions are presently trying to fill this seed gap.

The situation for tree seed can be compared to the agricultural seed systems in Africa, where the seed demand-supply relationship in many smallholder-farming systems does not function well. However, while commercial crop seed systems are being tried out by a multitude of NGOs, donor projects and CGIAR centres, free tree seed and seedlings are still being handed out by numerous institutions, projects and NGOs in most of Africa.

Successful development of decentralised tree seed systems will depend on a thorough understanding not only of technical aspects of seed production and handling, but also institutional, organisational, social and economic dimensions of development of rural producer organisations and information networks.

ISSAAC is based at ICRAF, Kenya, and operates in Burkina Faso, Malawi and Uganda, the countries which have been chosen to represent the three regions of Sahel, Southern and Eastern Africa, respectively. ISSAAC has a secretariat with a seed supply specialist based in Nairobi and who works closely with a national counterpart in each country. The present project period ceases end of year 2005.

Acknowledgements

The authors would like to thank the villagers and key persons interviewed for their patience and their answers to the numerous questions of the survey. We hope that this report may increase focus on their problems with obtaining trees and crops of high quality and yield.

Thanks are also due to personnel at CNSF for technical assistance, and to Anders P. Pedersen and Søren Moestrup, FLD, for their comments to earlier versions of the document.

DANIDA and ICRAF financed the research in this document.

Acronyms

CGIAR	Consultative Group on International Agricultural Research
CNSF	Centre National de Semences Forestières, Burkina Faso
DANIDA	Danish International Development Agency
FLD	Forest & Landscape Denmark
IFDC	International Center for Soil Fertility and Agricultural Development
INERA	Institut de l'Environnement et de Recherches Agricoles
ISSAAC	Improved Seed Supply for Agroforestry in African Countries
ICRAF	World Agroforestry Centre
JALDA	Japan Agricultural Land Development Agency
NGO	Non Governmental Organisation
NTSC	National Tree Seed Centre
PETREA	The research programme for People, Trees and Agriculture in Africa
SADC	Southern African Development Community
USAID	United States Agency for International Development

Contents

Summary in English

ISSAAC is a collaborative project involving the World Agroforestry Centre, FLD and the national tree seed centres in Burkina Faso, Uganda and Malawi. In Burkina Faso, Centre National de Semences Forestières is the national partner. The overall objective of the project is to improve farmer's access to agroforestry seed. The immediate objectives are to identify opportunities and constraints in the distribution of agroforestry seed, and to promote development of a more effective and sustainable seed distribution system in the three countries.

This report summarises the findings from a field survey of the tree seed sector in Burkina Faso. The aim is to describe the status for distribution of tree seed as well as institutional aspects of the system. Acquisition of agricultural seed is included in order to provide ideas for tree distribution systems. In the survey, 12 villages across the country were selected. In each village, 12 randomly selected farmers, two big tree planters and two nursery managers were interviewed according to a pre-tested questionnaire.

More than half of the farmers plant trees, and a total of 37 species were mentioned. Exotic species such as *Eucalyptus* and different fruit trees dominated, but some local fruit trees were planted as well. It seems that the choice of species is more diverse in the northern part of the country than in the centre and in the west. Some species were not available even though farmers would like to have them.

The majority of the farmers used seedlings as their reproductive material, followed by seed and grafted seedlings. In the majority of cases reproductive material is bought, but occasionally it is collected or received for free. Most reproductive material is obtained within the village. Exchange of plants between farmers is limited, but approximately half of the farmers are in contact with other farmers interested in tree production and planting. Many farmers are in contact with the forestry and agricultural services and NGOs, but few know services such as CNSF and INERA. The majority of the farmers indicate that they have taught themselves how to propagate or plant trees.

Most farmers use their own seed for the production of cereals. Only few buy seed at the market or from other sources, and the use of improved seed is very restricted. In contrast, horticultural seed is frequently bought at the market, and cottonseed is obtained at the company SOFITEX.

Nurseries are mainly privately managed and owned, and exotic species dominate the production. On average, each nursery produces 4000 plants annually, and almost two thirds of this production is sold. The rest is planted by themselves or is not used. A small proportion is given away. Most clients are private people. Small demand, poor prices, lack of seed, workforce and education, animal browsing and parasites are some of the problems observed in the use and production of plants.

The survey showed that few farmers use improved seed and that apparently the largest exchange of seed takes place at the local markets. The majority of the seed (both for agriculture and trees) come from farmers' own harvest or selection with the exception of cotton and horticultural seed. Farmers receive only little training related to trees, and there appears to be scope for a large improvement of the distribution of seed and plants in Burkina Faso.

Résumé en français

ISSAAC est un projet collaboratif entre le Centre agroforestier mondial (ICRAF), l'Institut danois des forêts et des paysages en anglais Forest & Landscape Denmark (jadis centre danois de semences forestières ou Danida Forest Seed Centre) et les centres nationaux de semences forestières du Burkina Faso, de l'Ouganda et du Malawi. L'objectif général du projet est d'améliorer la diffusion de semences agroforestières au profit des paysans. L'identification des opportunités et des contraintes observées dans la diffusion de semences agroforestières dans les pays sélectionnés et la promotion d'un système de diffusion de semences durable dans les dits pays sont les objectifs immédiats du projet.

La présente enquête entre dans le cadre d'une étude diagnostique du secteur des semences au Burkina Faso. L'étude diagnostique s'est proposée de dresser la situation actuelle des semences agricoles et forestières dans ses aspects institutionnels et organisationnels. Le système de diffusion des semences est analysé, les opportunités et les contraintes identifiées et les solutions pour rendre viable ce système proposées. L'enquête a mis l'accent sur les semences forestières. Douze villages ont été sélectionnés à travers le pays. Dans chaque village, il a été prévu de sélectionner 12 paysans au hasard pour les interviews. Cela a été possible dans 10 villages sauf dans 2 où respectivement 13 et 11 paysans ont été interviewés. Un questionnaire pré testé dans 2 villages a été utilisé. Egalement, 2 grands planteurs et 2 pépiniéristes dans chaque village ont été interviewés.

Plus de la moitié des paysans plantent des arbres et 37 différentes espèces font l'objet de plantation. Les espèces exotiques telle que *Eucalyptus* et les espèces fruitières sont les plus plantées, mais quelques fruitiers locaux sont plantés aussi. Il semble qu'en moyenne, le choix d'espèces des paysans est plus diversifié au nord qu'au centre et à l'ouest. Certaines espèces sont désirées par les paysans mais les plantules ne sont pas disponibles au niveau des villages.

La majorité des paysans utilisent des plantules dans le choix du matériel de reproduction, puis des graines et peu de paysans utilisent des greffes. Ce matériel de reproduction est acheté dans la plupart des cas, mais une bonne partie est collectée ou même reçu gratuitement. La grande partie du matériel reproductive est obtenue au niveau du village. Les échanges de plants entre les paysans sont limités, mais environ la moitié des paysans ont des contacts avec d'autres paysans qui s'intéressent à la plantation des arbres. Les paysans ont plus de contacts avec le service forestier, celui chargé de l'agriculture et les ONGs qu'avec le CNSF et l'INERA. La plupart des paysans indiquent qu'ils ont appris eux-mêmes à produire et à planter les arbres.

La majorité des paysans utilisent leurs propres semences pour la production céréalière. Peu de paysans achètent les semences au marché ou acquièrent des semences améliorées. Par contre, les semences maraîchères sont fréquemment achetées au marché et celles du coton acquises auprès de la SOFITEX.

La majorité des pépinières sont gérées par les privés et les espèces exotiques dominent la production. En moyenne, un peu plus de 4000 plants sont produits annuellement dans chaque pépinière et presque deux tiers de cette production est vendus. Le reste de la production est planté par les producteurs eux-mêmes ou n'est pas utilisé. La plupart des clients sont des privés. la mévente, le faible prix de vente des plants, le manque de clients, le manque d'eau, de semences, de formation, et de main d'œuvre, la divagation des animaux et les attaques parasitaires sont des contraintes observées dans la production et l'utilisation des plants.

Cette étude a montré que peu de paysans utilisent des semences améliorées et apparemment la plus grande part des échanges de semences a lieu sur la place du marché. La majorité des semences provient de la propre sélection ou récolte des paysans ; les semences maraîchères et celles du coton faisant exception. Les producteurs bénéficient de très peu de formation et d'appui sur l'utilisation des arbres. Une des conclusions que l'on peut tirer de cette étude est qu'il existe nécessité d'améliorer les systèmes de distribution et d'utilisation des semences et des plantules au Burkina Faso en vue de rendre l'agriculture et la foresterie plus durables.

1. Introduction

ISSAAC (Improved Seed Supply for Agroforestry in African Countries) is a Danida financed collaboration between the World Agroforestry Centre (ICRAF), Forest & Landscape Denmark (formerly Danida Forest Seed Centre) and national tree seed centres in 3 participating countries (Burkina Faso, Malawi and Uganda). In Burkina Faso, the tree seed centre is Centre National de Semences Forestières (CNSF). The overall objective of the project is to improve seed supply to tree planting farmers by establishing an understanding of opportunities and constraints for improving seed systems for agroforestry in the selected three countries.

The present survey is a part of a larger diagnosis of the tree seed sector in Burkina Faso. In the diagnosis we attempt to summarise the current situation within the tree seed sector and the agricultural seed sector as a whole. Most users of tree seed in Africa are farmers and as such tree seed cannot be seen in isolation from the agricultural sector and the policy environment that influences livelihood strategies of smallholder farmers. Furthermore, there may be important pathways for agricultural seed provision that may also be used for distribution of tree seed.

1.1 Background

A well-functioning seed system has been defined by Maredia *et al.* (1999) as 'one that uses the appropriate combination of formal, informal, market and non-market channels to stimulate and efficiently meet farmers' evolving demand for quality seed'. A well-functioning tree seed system therefore also requires availability of varieties that can meet the requirements of farmers and that farmers are well informed about the availability of these varieties.

In many African countries the National Tree Seed Centres (NTSCs) have traditionally had the responsibility to provide seed to tree planters[1]. In most countries the NTSCs, however, now play a minor role in tree seed procurement, while a large number of projects procure and deliver tree seed to farmers. Most of these projects exist for a limited time and are active in relatively small areas and work with a limited number of species[2]. Tree seed and seedlings production and distribution systems share these problems with agricultural seed and agricultural input systems, where most of the formal crop seed activities in sub-Saharan Africa have been through parastatals[3] (Tripp, 2001, Maredia *et al.* 1999, Wiggins and Cromwell, 1995; Friis-Hansen, 2000).

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[1] *In* Africa, twelve NTSC were established by the Canadian supported SADC Tree Seed Centres Network Project (1992 - 2001) - in Angola, Botswana, Lesotho, Mozambique, Namibia, Swaziland, or strengthened - in Malawi, Mauritius, South Africa, Tanzania, Zambia and Zimbabwe (Shumba and Mwale, 1998). The National Tree Seed Centre in Burkina Faso was supported by France, the Netherlands and Danida from 1983 to 2003. Danida supported tree seed centres in Tanzania from 1989 to 2000, in Eritrea from 1996 to 2002, and together with UNSO in Sudan from 1990 to 1996, in Ethiopia from 1992-2002, and in Uganda from 1996-2002 (with NORAD) (personal communication, Lars Graudal, Forest & Landscape Denmark). GTZ supported the National Tree Seed Centre in Kenya from 1985 to 1993 (personal communication, Bernard Kamondo, National Museum of Kenya).

[2] There are around 50,000 tree species on this planet, at least 2,500 of these species have been registered as agroforestry species (Simons, 1998) and only a small handful of these species have ever been tested for the performance of their populations in different environments.

[3] For example, the FAO Seed Development and Improvement Programme supported 60 countries during 1972-84, the World Bank supported 13 national seed projects and 100 other seed-related projects during 1975-85, and USAID provided long-term support to public bodies concerned with seed in 57 countries during 1958-87 (Wiggins and Cromwell, 1995).

For the majority of smallholders, success of the formal crop seed systems has been limited to a few crops such as hybrid maize and sorghum (Wiggins and Cromwell, 1995). Many of the crop seed parastatals have now been privatised or dissolved, mainly because they were seen as inefficient and too dependent on state or donor subsidies. However, access to improved seed of a wide variety of suitable crop varieties has not been improved by privatising the parastatals, and seed production and marketing is still a major limitation for poor farmers (Tripp and Rorbach, 2001).

The emerging consensus is that creation of sustainable crop seed systems will require a fundamental change in the approach of government, donors and NGOs. To develop a sustainable crop seed system, larger efforts will be required to build local marketing institutions, and the state should invest in supporting the development of a viable commercial seed sector in particular for rural retailers. The support should take into account the high transaction costs with larger numbers of dispersed and relatively isolated small-scale farmers (Tripp and Rorbach, 2001; Dimithe *et al.* 2001).

The change in crop seed systems has been underway for a relatively long time. Tripp and Rorbach (2001) describe the approach and degree of success of NGO/project attempts to improve local crop seed supply. The World Bank is promoting seed system change through 'Initiatives for Sustainable Seed Systems in Africa' (Gisselquist *et al.,* 1998) and SADC Regional Seed Security Network (SADC, 1998). The International Center for Soil Fertility and Agricultural Development (IFDC) is actively involved in country-specific assessments to promote the development of agricultural input markets in Africa (IFDC, 2000), supported by USAID, European Union, and a range of European donors.

Privatisation of NTSCs by governments and donors has been started in several countries in Africa– *e.g.* the NTSC in Uganda has ben privatised, Kenya Tree Seed Centre is now managed on a cost recovery basis, and the same is planned for the Malawi NTSC (personal information from NTSCs). The lesson from crop seed systems, however, is that privatisation in itself will not increase the reach of suitable seed to smallholders. The challenge to the tree seed sector is therefore to find suitable public/private collaborations.

Furthermore, due to nature-given differences between trees (perennial woody species) and annual crop species, not all aspects of crop seed systems are valid for tree seed systems. In particular the seed source identification/establishment and management is different due to the larger size, breeding systems, and longevity of perennial woody species as compared to crops. Furthermore, for practically all products from trees the seed is a very small part of the total cost of production. These nature-given differences indicate that seed production, procurement and distribution should be thought of at larger landscape units than for crop seed production.

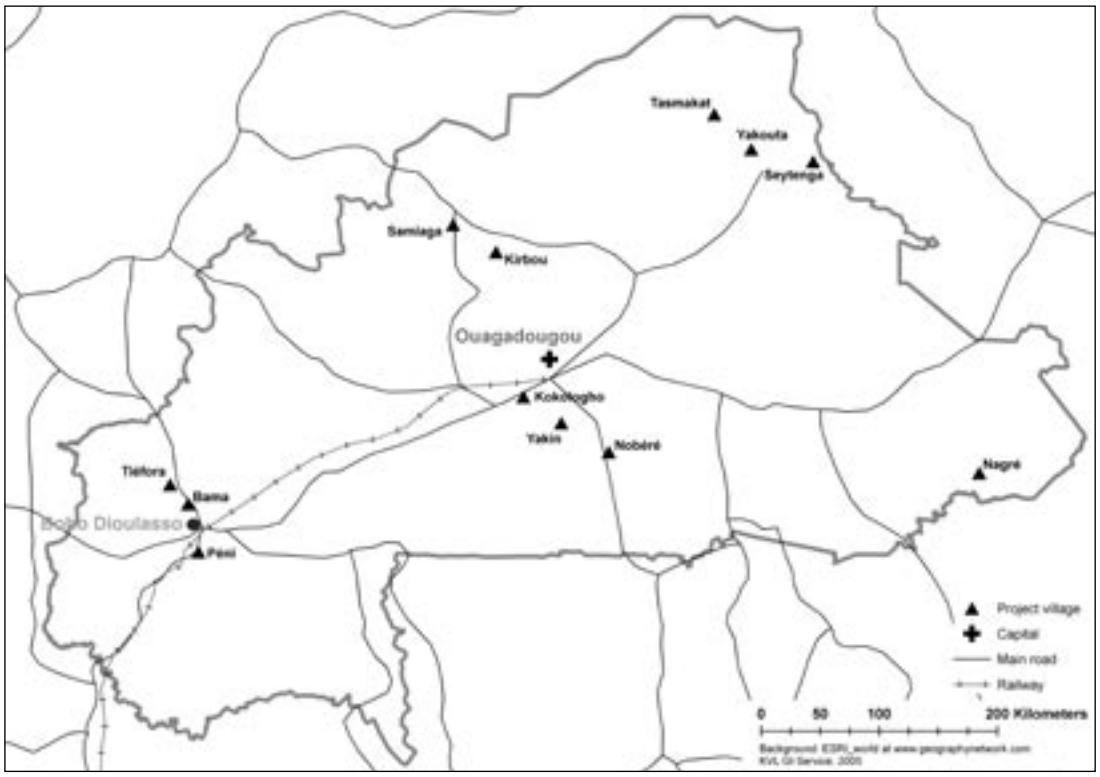
Some of the general characteristics of the agricultural seed sector in Africa that according to Tripp (2001) are of immediate relevance for tree seed systems are that:

- farmers in general have only limited access to improved seed of suitable varieties (other than hybrid maize and sorghum)
- only few varieties have been developed that are adapted to the great variety of agro-ecological and end-use characteristics that are required by African farmers,
- there is limited commercial development of seed production and distribution of many agricultural crops,
- free seed distribution is a serious constraint to the development of a commercial seed sector

In the present survey we attempt to identify some of the major patterns that characterise the seed distribution in Burkina Faso. Although the emphasis is on tree seed, the provision of agricultural seed is looked upon as well. We try to identify the extent of tree planting, which species are planted and the tree-related problems experienced by the farmers. The survey includes both farmers and nursery owners or managers with the aim to get a relatively complete picture of the tree seed sector at the local level.

2. Methods

The field survey took place in 12 villages scattered across the country (Table 1). The villages were selected according to the following criteria: Four of the villages were selected because CNSF had initiated participatory seed collection in the villages. Four villages were selected because it was known that there was at least one nursery in the village, and the last four villages were villages that were hitherto unknown to CNSF. The villages were selected geographically so as to have three villages in the northern zone of the country, six in the central zone and three in the south-western zone. In the northern and south-western zone there was one village of each category, whereas there were two in the Central zone. The location of the villages is shown in Map 1.



Map 1. Location of the selected villages.

Carte 1. La position des villages sélectionnés.

The interviews took place over four days in each village. The first day was used to contact authorities and make arrangements for the following days. The second day was used to interview key persons (authorities and elder people) and two organisations in the village. The third and fourth days were used to interview farmers and big tree planters (see below).

In each village, it was intended to select 12 farmers randomly for interviews, but in the villages of Nagré and Pení 13 and 11 farmers were interviewed, respectively. In some villages it was not possible to make a true random selection due to lack of a census of the population. In these villages, we contacted key persons such as extension officers, who helped us identify at least two farmer's organisations. Farmers were then selected at random within member lists of these organisations. Thus it is likely that the sample is biased in the sense that the interviewed farmers are more

organised than the average population of farmers. By chance, three farmers who identified themselves as 'pépinieristes' (nursery owners or workers) were part of the sample. Since we wanted to make this survey as representative as possible, they have been included on equal foot with the rest of the farmers.

During talks with key persons, two farmers characterised as 'big tree planters' were identified and interviewed following the same questionnaire as the farmers selected randomly. These were meant to be the most experienced tree planters in the village. The objective was to interview people with experience in tree planting and compare them to the rest of the farmers.

Similarly, nurseries in the village were identified, and where possible two nurseries in each village were chosen for interviews. In some cases no or only one nursery were present, but in contrast in the villages of Nobéré and Yacouta three nurseries were interviewed (table 1). The total number of nurseries interviewed was 22.
The questionnaire for farmers focussed on basic information on the farmers and their main activities, questions on tree planting and the species used (including species not available), seed used in agriculture and contacts to extension services. The questionnaire has been included as appendix 1.

Table 1: Number of interviews for the different categories for each village
Tableau 1. Nombre d'interviews pour les différentes catégories de personnes dans chaque village.

Zone/ village	Criteria for choice *(critères de choix)*	Farmers *(paysans)*	Big tree planters *(grands planteurs)*	Nurseries *(pépinières)*
Centre				
Kirbou	Presence of seed production committee	12	2	0
Kokologho	Presence of seed production committee	12	2	2
Nagré	Other village	13	2	2
Nobéré	Presence of nursery, CNSF/PETREA project	12	2	3
Soumyaga	Other village	12	2	2
Yakin	Presence of nursery	12	2	1
North				
Seytenga	Presence of seed production committee	12	2	2
Tasmakat	Other village	12	2	1
Yacouta	Presence of nursery	12	2	3
West				
Bama	Presence of nursery	12	2	2
Péni	Other village, CNSF/PETREA project	11	2	2
Tiéfora	Presence of seed production committee	12	2	0 (2)*

*There were no nurseries at Tiéfora, but two interviews were carried out at nurseries in the local provincial capital of Banfora. (Il n'y avait pas de pépinières à Tiéfora, mais deux entretiens ont pris lieu à Banfora, le centre régionale).

The questionnaires were based on questionnaires from a similar survey carried out in the region of Kabale in Uganda. A first test was made in the villages of Kokologho and Péni. Following these experiences, the questionnaire was adjusted, and two teams working in parallel carried out the rest of the interviews. The questionnaire was formulated in French, and the questions were translated and asked in the local language to the farmers. However, as it was later realised, some of the questions were not formulated clearly, which led to different kinds of answers from the two teams. An example was a question on the inputs on the production, which was not defining whether the question was on agricultural inputs or input used for the production of seedlings. This question has been omitted

from the results. Another example was the question on where the seed/seedlings came from, which gave answers on either the geographical location or on organisations or persons. In this case we have chosen to present the results, because they are essential to the understanding of the seed delivery system. Another problem is that in some cases, not all answers have been filled in (e.g. origin of seed), giving a more limited material.

Differences between average numbers of species planted between regions were analysed by analysis of variance with region as the single factor. Whenever values are shown in percent, it should be remembered that the uncertainty is larger for big tree planters than for farmers, because the sample of farmers is larger.

3. Use of trees by farmers and big tree planters

General description of farmers and big tree planters

The ethnic composition of the farmers and the big tree planters was almost identical. Approximately one half was Mossi, whereas the other half included a number of smaller ethnic groups with none of them exceeding 15 % (Table 2). 133 of the farmers (92 %) said they owned their land, which corresponded to 22 (94 %) of the big tree planters.

Table 2. Ethnic composition of interviewees
Tableau 2. Composition ethnique des personnes interviewées.

	Numbers *(nombres)*		%	
	Farmers *(paysans)*	Big tree planters *(grands planteurs)*	Farmers *(paysans)*	Big tree planters *(grands planteurs)*
Mossi	70	12	49	50
Peulh	21	3	15	13
Gourmantché	5	1	3	4
Rimaïbé	7	2	5	8
Tiéfo	4	1	3	4
Bobo	12	2	8	8
Karabo	10	2	7	8
Dioula	3		2	
Dafing	3		2	
Gouin	1		1	
Sonray	1		1	
Bella	4		3	
Touareg	1		1	
Boussanga	1		1	
Not known	1	1	1	4
Total	144	24	100	100

Almost all interviewees had agriculture as a principal activity. However, many were also involved in animal husbandry, commercial activities and other activities (Table 3). There were no clear differences between the activities of the farmers and the big tree planters.

Table 3. Principal activities of the interviewees. Many interviewees indicated more than one principal activity. n=144 (farmers), n=24 (big tree planters).
Tableau 3. Les principales activités des personnes interviewées. Beaucoup de personnes ont indiqué plus d'une activité principale. n=144 (paysans), n=24 (grands planteurs).

	Numbers *(nombres)*		%	
	Farmers *(paysans)*	Big tree planters *(grands planteurs)*	Farmers *(paysans)*	Big tree planters *(grands planteurs)*
Agriculture *(agriculture)*	140	23	97	96
Animal husbandry *(élevage)*	78	12	54	50
Commerce *(commerce)*	17	5	12	21
Others *(autre)*	37	9	26	37
No answer *(pas de réponse)*	0	1	0	4

On average, the big tree planters had more land available than the ordinary farmers (Table 4). This was the case both for cultivated land, fallow, and plantations. It should be noticed, however, that some of the big tree planters have only little land available as indicated by the ranges given in Table 4.

Table 4. Average land surface available as indicated by interviewees. All values are in ha. Minimum and maximum values are in brackets.
Tableau 4. Les surfaces moyennes des terres disponibles comme indiquées par les personnes interviewées. Toutes les valeurs sont en ha. Les valeurs minimales et maximales sont entre parenthèse.

	Farmers *(paysans)*	Big tree planters *(grands planteurs)*
Cultivated land *(terres cultivés)*	3.8 (0.3-10)	8.9 (1-36)
Fallow *(jachères)*	3.6 (0.5-15)	8.5 (1-42)
Plantation *(plantations)*	1.3 (0.002-7)	5.0 (0.002-25)

Planting practices

The farmers were asked whether they had ever planted trees, and whether they had planted trees recently. In general, 'recently' was understood as within the last couple of years, but the interpretation of this question is not clear-cut. Most of the farmers (87 %) said that they had planted trees, and 58% said they had planted trees recently. Naturally, all the big tree planters had planted trees, and two thirds of them had planted trees recently. Although it may be questioned if the sample is representative, there is no doubt that there is a large and ongoing planting activity in the country.

Table 5. Number of interviewees saying that they have planted trees.
Tableau 5. Le nombre de paysans interviewés indiquant qu'ils ont planté des arbres.

	Numbers *(nombres)*		%	
	Farmers *(paysans)*	Big tree planters *(grands planteurs)*	Farmers *(paysans)*	Big tree planters *(grands planteurs)*
Has planted *(ont planté)*	125	24	87	100
Has planted recently *(ont planté récemment)*	83	16	58	67

As indicated in Fig. 1, in most villages the majority of the interviewed farmers have planted trees. The only exception is Seytenga, where only three out of twelve have planted trees. The majority of the population in Seytenga is Peulh which have herding as a main activity. However, overall we cannot observe any regional differences in the number of farmers who plant.

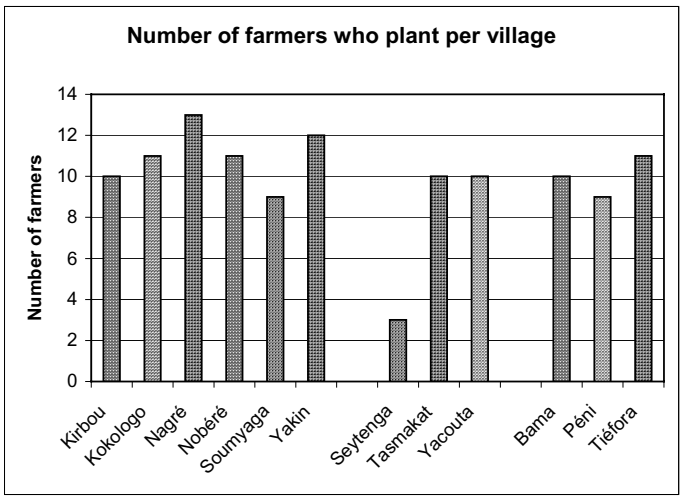


Figure 1. The number of farmers who say that they have planted trees. N=12 for all villages except Péni (n=11) and Nagré (n=13). The villages in the left group belong to the central zone of Burkina Faso, the villages in the middle are from the north, and the villages to the right are from the south-western zone.
Figure 1. Le nombre de paysans interviewées indiquant qu'ils ont planté des arbres. N=12 pour tous les villages sauf Péni (n=11) et Nagré (n=13). Les villages qui sont présentés dans le groupe de gauche sont du Centre du Burkina Faso, les villages du milieu sont du Nord, et ceux de droite sont du Sud-ouest.

Preferences

The preferences as regards tree planting can be measured in several ways. We have applied two methods: registering the species that the farmers actually say they have planted, and asking them which species they would like to have, but that are not currently available.

There were interesting regional differences in the number of species planted by farmers (Fig. 2). In the northern region, approximately 15 species were mentioned per village, whereas in the central region, 8 –12 species were planted. In the south-western region, only about five species were planted per village, indicating that the diversity of species planted declines from north to south-west. This difference was highly significant ($P<0.0001$). For big tree planters the trend was similar, but there was much more variation between villages, and the differences were only at the limit of significance ($P=0.06$).

The farmers planted 37 different species, whereas the big tree planters planted 32 species. The complete species list with the numbers of farmers appears in Appendix 2. However, a few species dominated the picture, and the most frequently planted species appear in Figure 3. Mango (*Mangifera indica*) was the most frequently planted species, planted by more than 50% of the farmers and 80% of the big tree planting farmers. The second most planted species was *Eucalyptus camaldulensis*, followed by neem (*Azadirachta indica*) for the farmers and guava (*Psidium guajava*) for the big tree planters. Cashew (*Anacardium occidentale*) was at the fourth place for both groups. Only then, in fifth place, the first indigenous species appear, represented by *Acacia nilotica* and *Faidherbia albida*. Apart from the larger frequency of guava for big tree planters, there does not appear to be major differences between the two groups.

During the interviews it was also asked if there were species that the farmers wanted, but that were not available (Fig. 4). Mango was again the most wanted, but this time the native *Parkia biglobosa* (néré) came second for both groups. The total number of species wanted was 35 for the farmers, but only 19 for the big tree planters (See Appendix 2 for the complete list). This question may be a bit speculative since farmers could also identify species that were not adapted to the site.

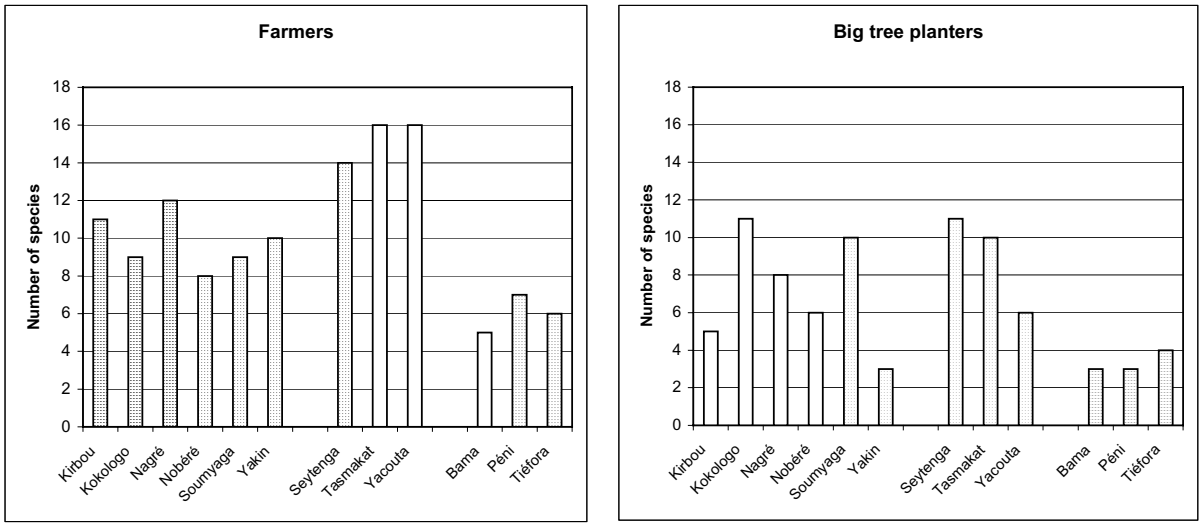


Figure 2. Number of species planted by farmers (left) and big tree planters (right) in the 12 villages. Note that there were 11 to 13 farmers and only two big tree planters per village. The villages in the left group belong to the central zone of Burkina Faso, the villages in the middle are from the north, and the villages to the right are from the south-western zone.

Figure 2. Le nombre d'espèces plantées par les paysans (à gauche) et les grands planteurs (à droite) dans les 12 villages. Notez qu'il y avait 11 à 13 paysans par villages et seulement deux grands planteurs par village. Les villages dans le groupe de gauche sont du Centre du Burkina Faso, les villages du milieu sont du Nord, et les villages de droite sont du Sud-ouest.

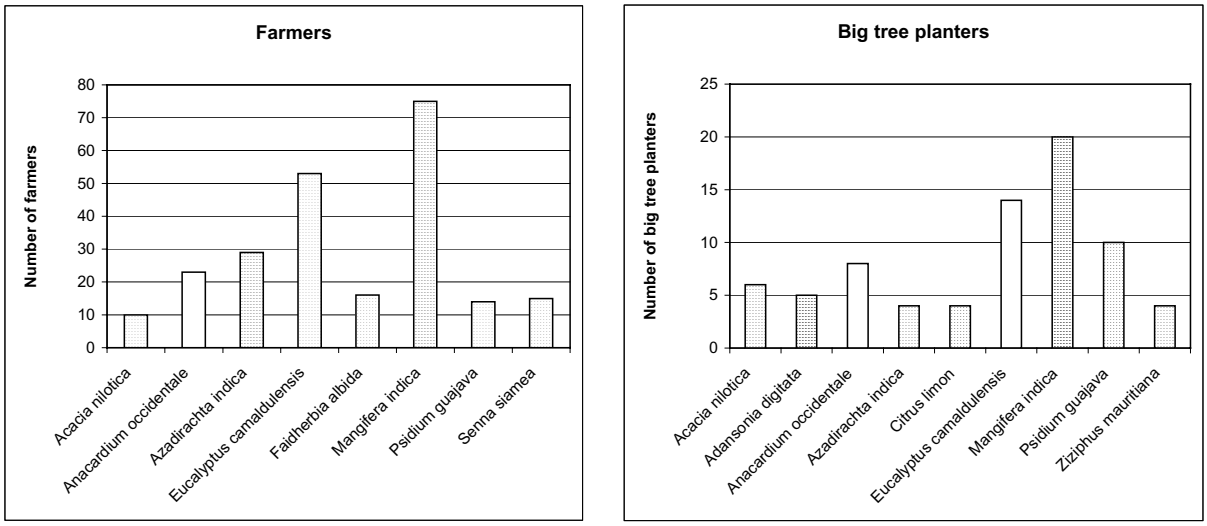


Figure 3. The most frequently planted species by farmers (left) and big tree planters (right). Species that were planted by less than 10 farmers, and species that were planted by less than four big tree planters, are not included (see Appendix 2 for a complete list). n=144 (farmers), n=24 (big tree planters).
Figure 3. Les espèces les plus fréquemment plantées par les paysans (à gauche) et les grands planteurs (à droite). Les espèces qui étaient plantées par moins de 10 paysans, et celles qui étaient plantées par moins de 4 grands planteurs ne sont pas incluses (voir l'appendice 2 pour la liste complète). n=144 (paysans), n=24 (grands planteurs).

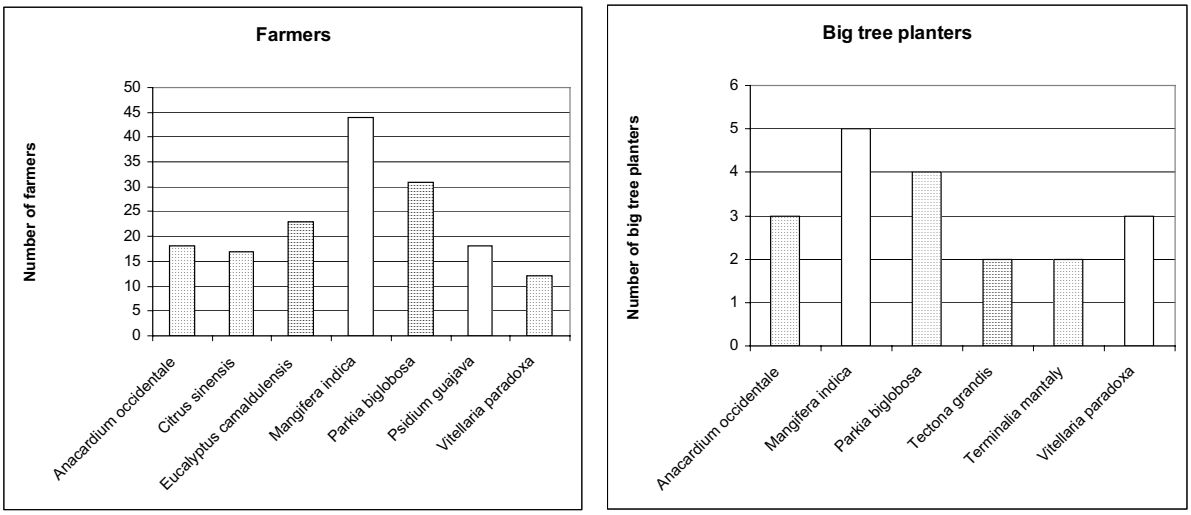


Figure 4. The species described as wanted, but not available, by farmers (left) and big tree planters (right). Species that were wanted by less than 10 farmers, and species that were wanted by less than two big tree planters, are not included (see Appendix 3 for a complete list). n=144 (farmers), n=24 (big tree planters).
Figure 4. Les espèces désirées mais non disponibles pour les paysans (à gauche) et les grands planteurs (à droite). Les espèces qui étaient plantées par moins de 10 paysans et les espèces qui étaient plantées par moins de 2 grands planteurs ne sont pas incluses (voir appendice 3 pour la liste complète). n=144 (paysans), n=24 (grands planteurs).

Constraints

The farmers were asked directly which problems they had concerning the use of tree seed and plants. The answers were afterwards grouped into different categories as appearing in figure 5. Only 58 of the farmers (corresponding to 40%) indicated that they had problems related to the use of tree seed, whereas 108 (or 75%) identified constraints related to the use of seedlings. This is probably a

reflection of the more frequent use of seedlings compared to seed. For big tree planters, the same trend was observed. 22 of the 24 big tree planters identified constraints related to seedlings, compared to only 15 who identified problems related to the use of seed.

The pattern of constraints was the same for both farmers and big tree planters. The most common problem for the use of seed was the availability, whereas few indicated that the price was too high or that they did not have sufficient know-how (Fig. 5). The category 'others' includes lack of water, animals, poor germination, difficulties in getting plastic bags etc.

Farmers indicated that the major constraints for use of seedlings were grazing animals, lack of water and too high prices (in decreasing order, ranging from 27 to 42% of the farmers). The category 'elevated price' also includes those who say that they have no money with which to buy plants. A few identified lack of materials, access to land and termites as constraints. The pattern was the same for big tree planters, except that none of the big tree planters mentioned access to land as a problem. Other constraints included bush fire (indicated by 5 farmers), lack of manpower, diseases, rodents, lack of information, availability of some species etc.

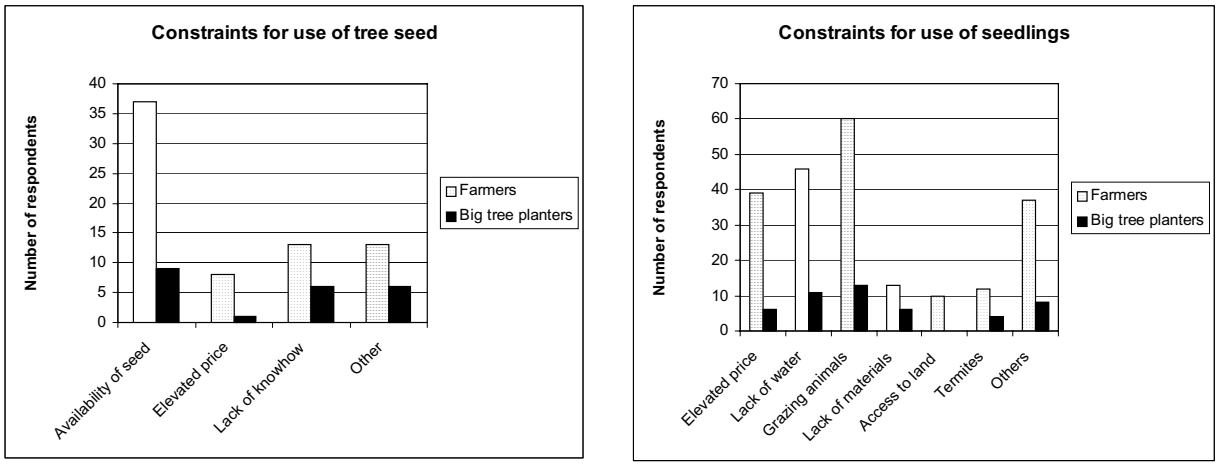


Figure 5. The constraints for use of tree seed (left) and seedlings (right) as indicated by farmers (n=144) and big tree planters (n=24).

Figure 5. Les contraintes pour l'utilisation des semences d'arbres (à gauche) et des plantules (à droite) indiquées par les paysans (n=144) et les grands planteurs (n=24). Concernant les contraintes pour l'utilisation de semences les catégories cités sont : Disponibilité de semences, prix élevé, manque de savoir-faire, et autres. Les contraintes pour l'utilisation de plantules cités sont : Prix élevé, manque d'eau, divagation des animaux, manque de matériel, accès au terre, termites et autres.

Farmers and big tree planters were also asked to explain the reason why they could not have the wanted (but not available) species identified earlier in this document (see fig. 4). A range of explanations was given (Fig. 6). The most frequent reason was that the species was not available at the site, cited by 30% of the farmers and by 60% of the big tree planters. It is interesting that the big tree planters gave this reason more frequently, because they have more interest in tree planting and thus could be expected to experience lack of planting material more often than the ordinary farmers. Again, the fact that the plants (or seed) are

not available can be because the species is not adapted to the site, or because the farmer does not know where to get it.

Elevated prices and lack of know-how was indicated in 10-15% of the cases for farmers, but below 6 % for big tree planters. No land to plant on was given as explanation in 5% of the cases for farmers, but this was not a problem for the big tree planters. 'Other reasons' was 15-20 % for both farmers and big tree planters. This category included a broad range of explanations, including termites, lack of water, lack of suitable soils, continuity of the activity (?), attacks (of insects and fungi) and mortality.

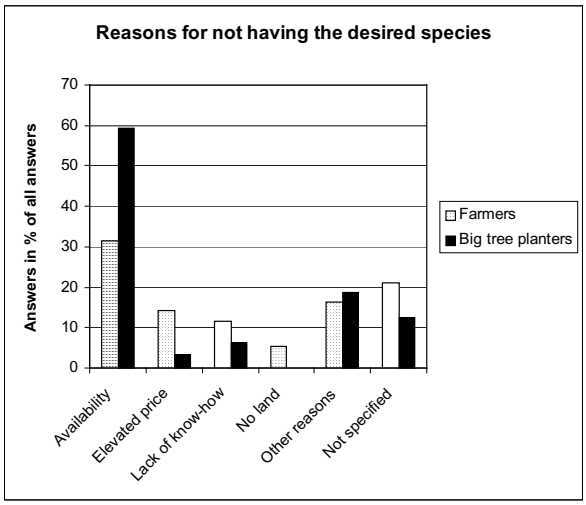


Figure 6. The reasons explaining why farmers and big tree planters do not have the species that they want. Note that the values are given as the percent of the total number of answers (i.e. the sum of species identified by each respondent. n=241 for farmers, n=32 for big tree planters).
Figure 6. Les raisons expliquant pourquoi les paysans et les grands planteurs ne disposent pas les espèces qu'ils veulent. Notez que les valeurs sont en pour cent du nombre total des réponses (c.à.d. la somme des espèces indiquées par chaque personne interviewée). Les catégories cités sont : Disponibilité, prix élevé, manque de savoir-faire, manque de terre, autres raisons, et non spécifié. n=241 pour les paysans, n=32 pour les grands planteurs).

Contacts

42% of the farmers said that they were in contact with other farmers involved in tree seed or plant production. The figure was higher for big tree planters, reaching 58 %.

In the interviews, farmers were also asked if they had contact to institutions and organisations working with seed and trees (Fig. 7). Farmers and big tree planters had the same patterns of contact, except perhaps that big tree planters were more in contact with the forestry service. The most frequently cited contacts were the forestry and agricultural services, NGOs and other organisations. Only about 10% had contact to CNSF and its regional departments, and even less had contact to INERA. The CNSF contacts were also present in villages where CNSF had not intervened with projects.

50% of the farmers said that they used knowledge they had learned by themselves when they planted or sowed trees. 40% had received training, and a little less than 30% had received information from the radio. The number of people

who received information from newspapers and journals was negligible. Unfortunately the category 'others' was not included in this question.

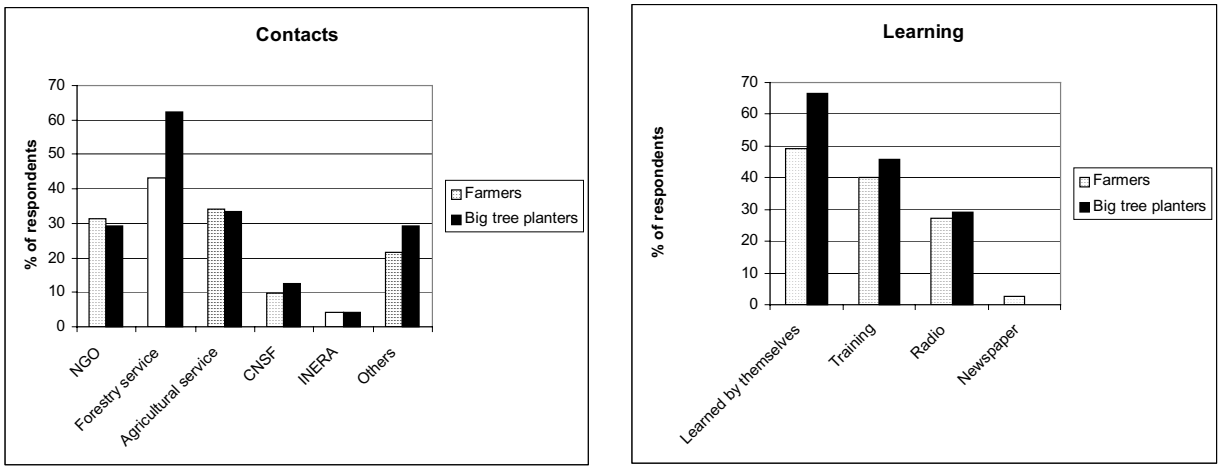


Figure 7. Farmer's and big tree planter's contacts to institutions and organisations working with tree seed and trees (left) and ways of learning how to deal with seed and plants (right). n=144 (farmers), n=24 (big tree planters). Many respondents indicated more than one way of learning.
Figure 7. Les contacts des paysans et des grands planteurs avec les institutions et les organisations travaillant dans le domaine des semences et des arbres (à gauche) et les voies d'apprentissage en relation avec les semences et les plants (à droite). n=144 (paysans), n=24 (grands planteurs). Plusieurs personnes indiquaient plus d'une voie d'apprentissage. Les catégories indiqués pour les contacts sont : ONG, service forestière, service agricole, CNSF, INERA, et autres. Les catégories indiqués pour les manières d'apprentissage sont : eux-mêmes, une formation, le radio, les journaux.

Seed systems for tree seed

The majority of the farmers used seedlings when choosing reproductive material, followed by seed. Only a small group used grafted plants (Fig. 8). The big tree planters seemed to have a larger tendency to use seed, since this was almost as commonly used as seedlings.

The grafts were almost exclusively mango, the only exceptions being a couple of grafted lemon (*Citrus limon*), orange (*C. sinensis*) and guava. A large proportion of the farmers used seedlings of mango, but still with a large proportion using seed and grafts (Fig. 8). Assuming that seedlings are from seed, then the large majority does not access early fruiting scion material. This also indicates low access to know-how about mango production. The big tree planters used grafts more frequently, with seedlings and seed at the second and third places.

Cashew was the only species mainly propagated by seed. For the rest of the species, the largest part was propagated by seedlings.

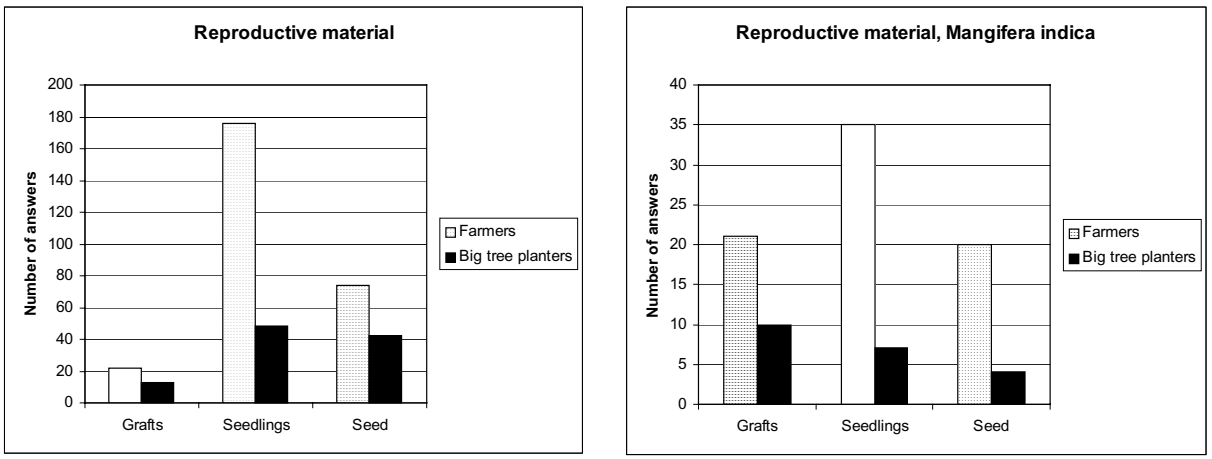


Figure 8. Farmer's and big tree planter's use of reproductive material for all species (left) and for mango (right). The numbers indicate the sums of all species used by each farmer/big tree planter. n=144 (farmers), n=24 (big tree planters). Some respondents indicated that they used more than one sort of reproductive material for a species. *Figure 8. Les types de matériel de reproduction (greffons, plantules, semences) pour toutes les espèces (gauche) et pour le manguier (droite). Les chiffres représentent les sommes de toutes les espèces utilisées par chaque paysan / grand planteur. n=144 (paysans), n=24 (grands planteurs). Quelques personnes interviewées ont indiqué qu'elles ont utilisé plus d'un seul type de matériel de reproduction pour une espèce.*

The question on where the reproductive materials were obtained was open-ended and gave two kinds of answers, related either to a geographical place or to the organisation where seed/seedlings were obtained. Despite this insufficiency we chose to present the data, because they show that most farmers and big tree planters do not travel far to get their trees (Fig. 9). Both for farmers and big tree planters, the majority of the reproductive materials were obtained in the village. Much smaller proportions were obtained at NGO's and at regional level (i.e. outside the village territory, usually in the main city of the region), and very few seed or plants were obtained from the forestry services.

The data material is too small to show clear differences between species as to where they are obtained. It is clear, however, that the species where people have travelled to get them (regional) are almost exclusively the commercial fruits (mango, guava, cashew) and *Eucalyptus camaldulensis* which is also producing commercial products (data not shown). The NGOs are supplying a wide range of species, but the largest diversity is found in the trees that are obtained within the village. For the forestry service, the material is too small to say anything meaningful.

Results indicated that the major part of the material was bought (Fig. 10). However, a substantial proportion (approximately the half) was collected or received for free. The approximately 20% that was received for free indicate that some exchange of germplasm takes place. There were no clear differences between farmers and big tree planters. When describing the practices they use for collection of seed, the respondents often answered 'on a good tree'. This may indicate that they are familiar with the idea of genetic improvement, but also that the material they collect are of a very narrow genetic basis.

Cross-tabulations demonstrated that the majority of the grafts were bought. The same applied to seedlings, but here substantial contributions were collected or received free. For seed, the largest proportion was collected, but also with large

parts being bought or received for free (Table 6). Another cross-tabulation (not shown) demonstrated that 80-90% of the respondents who had received material from NGOs had had it for free, indicating that the majority of NGOs give away the seeds and plants.

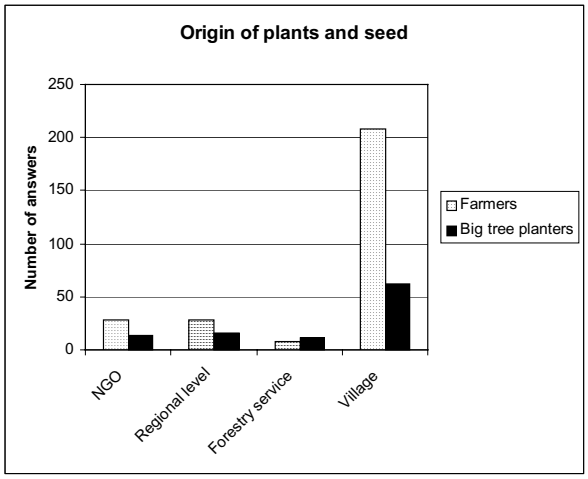


Figure 9. Farmer's and big tree planter's information on where they obtain the reproductive material that they sow or plant. The category 'Regional level' means that seed or plants are obtained outside of the village territory, typically in the major centres of the region. The numbers indicate the sums of all species used by each farmer/big tree planter. Note that the figures are based on species acquisition, not quantities of seed/seedlings. n=144 (farmers), n=24 (big tree planters). Some respondents indicated that they used more than one place of acquisition.
Figure 9. Les informations des paysans et grands planteurs indiquant les sources de matériel de reproduction semé ou planté. Les catégories cités sont : ONG, niveau régional (les semences et plantules sont obtenu hors de la village, souvent dans les centres régionaux), service forestière, et au village. Les nombres indiquent les sommes de toutes les espèces utilisées par chaque paysan/grand planteur. Notez que les figures sont basées sur l'acquisition des espèces et non pas sur les quantités de semences/ plantules. n=144 (paysans), n=24 (grands planteurs). Quelques personnes interviewées ont indiqué qu'elles utilisent plus d'une source d'acquisition de matériel de reproduction.

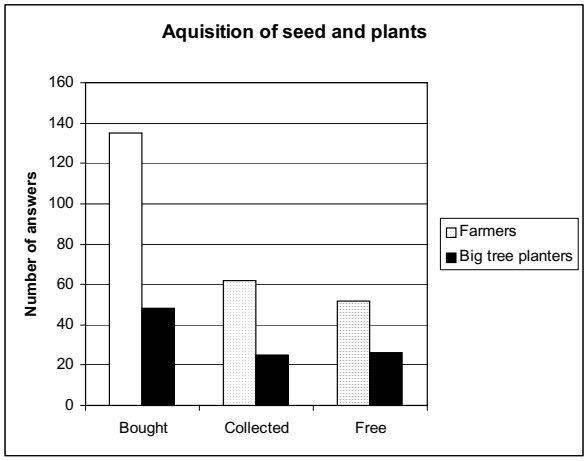


Figure 10. Farmer's and big tree planter's information on how they obtain their reproductive material. The numbers indicate the sums of all species used by each farmer/big tree planter. Note that the figures are based on species acquisition, not quantities of seed/seedlings. n=144 (farmers), n=24 (big tree planters). Some respondents indicated more than one mode of acquisition for a species.
Figure 10. Les informations des paysans et grands planteurs indiquant comment ils acquièrent le matériel de reproduction. Les nombres indiquent les sommes de toutes les espèces utilisées par chaque paysan / grand planteur. Les catégories cités sont : Acheté, collecté et cadeau (gratuit). Notez que les figures sont basées sur les modes d'acquisition des espèces et non pas sur les quantités de semences / plantules. n=144 (paysans), n=24 (grands planteurs). Quelques personnes interviewées ont indiqué plus d'un mode d'acquisition pour une espèce.

Table 6. Cross-tabulations of farmers and big tree planters mode of acquisition and type of reproductive material.
Tableau 6. Tableau croisé dynamique des modes d'acquisition et le type de matériel de reproduction chez les paysans et les grands planteurs.

	Farmers *(paysans)*				Big tree planters *(grands planteurs)*			
	Bought *(acheté)*	Collected *(collecté)*	Free *(gratuit)*	Total	Bought *(acheté)*	Collected *(collecté)*	Free *(gratuit)*	Total
Graft *(greffons)*	17	1	2	20	11	1	0	12
Seedlings *(plantules)*	96	30	28	154	28	5	15	48
Seed *(semences)*	22	31	22	75	9	19	11	39
Total	135	62	52	249	48	25	26	99

Exchange of plants

Almost all farmers and big tree planters used all or part of the production for themselves (Figure 11). The three farmers who were at the same time nursery owners, and who sold or gave away their production, can partly explain that 5% of the farmers did not use plants themselves.

The exchange of plants between farmers was limited. 17% of the farmers gave away plants and seed, but only seven farmers (corresponding to 9%) sold part of their production. The three nursery owners were of course part of this. Big tree planters were more active in exchanging material, the fraction being 32% both for sale and for giving away plants.

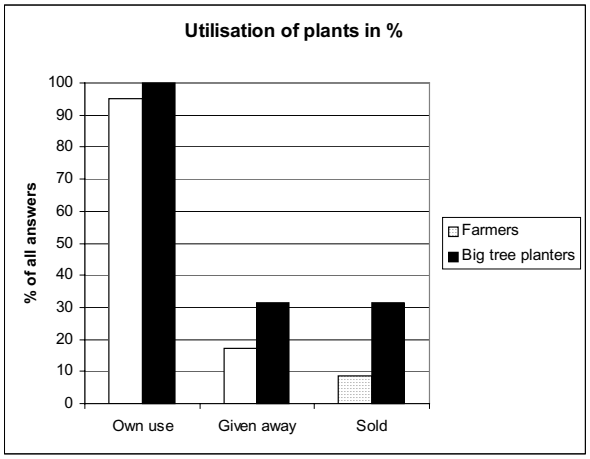


Figure 11. Farmer's and big tree planter's information on how they use their reproductive material. The values are given in percent of all answers. n=98 (farmers), n=19 (big tree planters). In some cases, this question was not answered. Respondents often indicated more than one use of a species.
Figure 11. Les informations des paysans et grands planteurs indiquant comment ils utilisent leur matériel de reproduction. Les valeurs sont en pour cent de touts les réponses, et les catégories sont : Utilisation propre, donnés cadeau, et vente. n=98 (paysans), n=19(grands planteurs). Dans quelques cas, cette question n'a pas été répondue. Les personnes interviewées ont souvent indiqué plus d'une utilisation pour une espèce.

4. Use of agricultural seed

The main purpose of the questions on agricultural seed acquisition was to identify possible alternative pathways for distribution of agroforestry tree seed.

Almost all, both farmers and big tree planters, used agricultural seed of their own production (Fig. 12). Also, many bought seed at the market or used improved seed that was obtained at different sources, depending on the crop. The term improved seed is a bit ambiguous in this sense, since one must assume that part of the vegetable seed bought at the market is actually improved varieties. Also, there is reason to believe that part of the seed supplied by NGOs is improved. There were no clear differences between farmers and big tree planters, except perhaps that a larger fraction of the big tree planters used improved seed. In the following, we present only data for the farmers, because data for the big tree planters are limited and not very different.

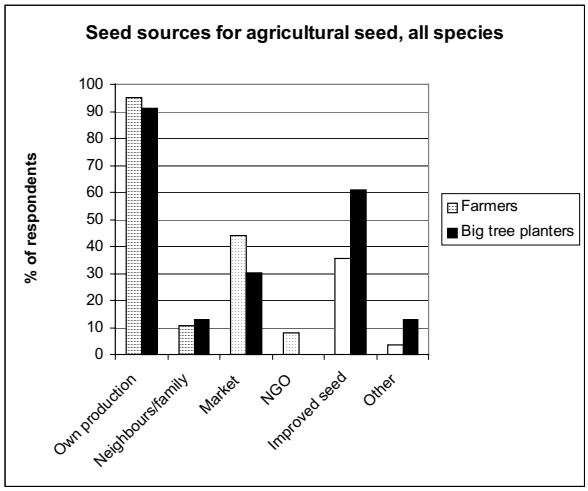


Figure 12. Farmer's and big tree planter's seed sources for agricultural seed in percent, for all respondents to the question. The values represent all crop types. n=141 (farmers), n=23 (big tree planters).
Figure 12. Les sources de semences agricoles et horticoles en pour cent, pour tous les paysans et les grands planteurs. Les valeurs représentent touts les types de cultures. Les catégories citées sont : Production propre, voisins / famille, acheté au marché, ONG, semences améliorés et autres. n=141 (paysans), n=23 (grands planteurs).

There were distinct differences between the different types of crops. For cereals, in particular millet and sorghum, the seed was almost exclusively from the farmer's own production (Fig. 13). A few bought seed at the market (less than 10 %), and very few received seed from friends and family or used improved seed. Own production was also the most important for maize and rice, but a larger proportion came from improved seed and from the market, respectively. For maize, the source of improved seed was frequently the 'service agricole' and to a lesser degree CRPA (Centres Regionaux de Production Agropastorale) and INERA. For rice, a large proportion of the seed was bought at the market, but here the statistical material is weaker since fewer farmers used this crop. For these important crops, farmers often said that they produced their own seed, but that in the case of a poor harvest they had to buy new seed at the market for the subsequent cultivation period.

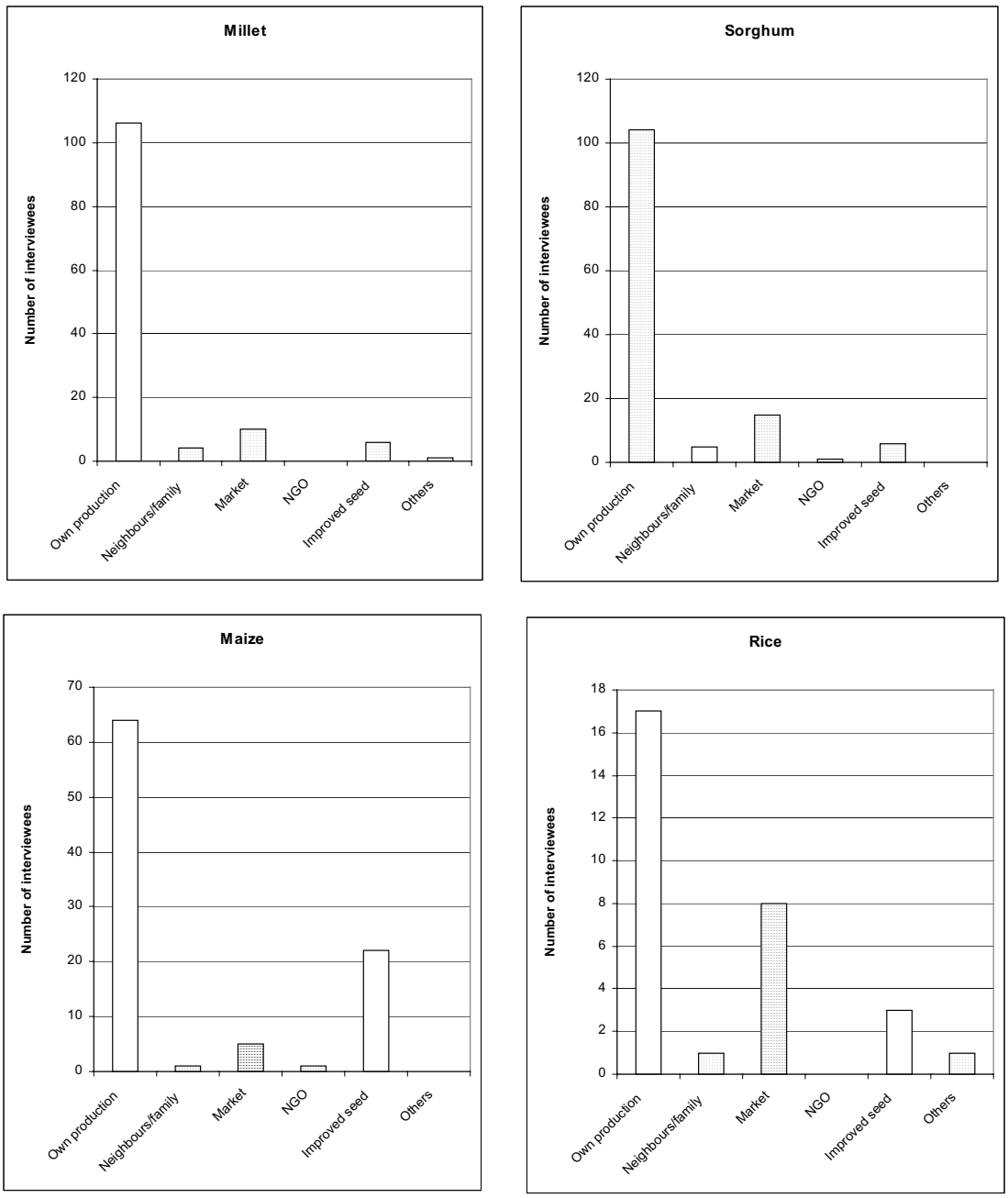


Figure 13. Farmer's indications of where they get their seed for millet, sorghum, maize and rice. n=141. Farmers could indicate more than one source for each crop.
Figure 13. Les sources de semences des paysans pour le mil, le sorgho, le maïs et le riz. n=141. Les catégories citées sont : Production propre, voisins / famille, acheté au marché, ONG, semences améliorés et autres. Les paysans pourraient indiquer plus d'une source de semences pour chaque culture.

Two crop types were very different from the rest of the crops. For cotton, the majority of the growers used improved seed that they obtained from SOFITEX (Fig. 14). Only a small group used seed of their own production.

Vegetable seed was most frequently obtained at the market. It is likely that a part of this seed is improved seed from commercial vegetable seed suppliers, brought to the market by seed merchants. The group includes aubergine, cabbage, onion, peas, paprika/chili and tomatoes. Small contributions came from own production, neighbours and family, NGOs and improved seed (no major source).

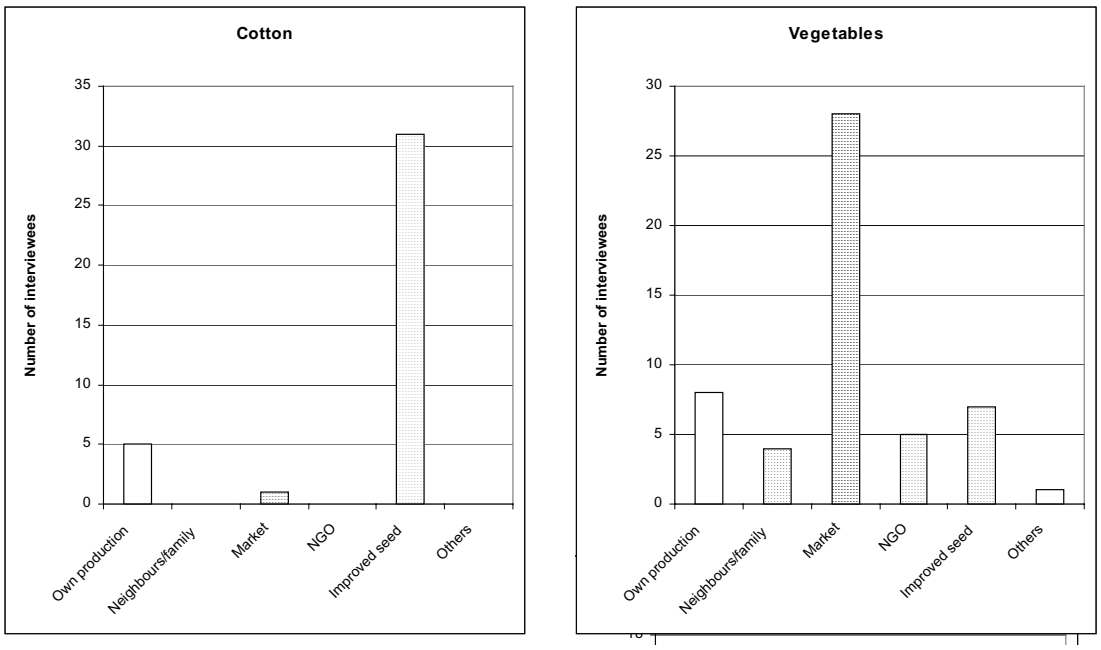


Figure 14. Farmer's indications of where they get their seed for cotton and vegetables. n=141. Farmers could indicate more than one source for each crop.

Figure 14. Les sources de semences de coton et de légumes. Les catégories cités sont : production propre, voisins / famille, acheté au marché, ONG, semences améliorées et autres. n=141. Les paysans pourraient indiquer plus d'une source de semences pour chaque culture.

Groundnuts, cowpea, roselle and sesame had a more or less similar pattern of acquisition, with the majority being from the farmer's own production, and a minor part coming from the market. Other sources were almost negligible (Fig. 15).

The final group of seed include a number of small, mainly traditional crops (Fig. 16), including calabash (*Lagenaria siceraria*), dâ (kenaf, *Hibiscus cannabinus*), fonio (*Digitaria exilis*), gombo (*Abelmoschus esculentus*), yams (*Dioscorea spp.*), water melon (*Citrullus lanatus*), sweet potatoes (*Ipomoea batatas*), 'pois de terre' (bambara groundnut or *Voandzeia subterranea*), and soybean (*Glycine max*). These seed were mainly obtained from farmer's own production and from the market, with a few getting the seed from their neighbours and family.

From the above it seems that most crops are based on seed from farmer's own selection and production. The two exceptions are horticultural seed (vegetables), being obtained mainly at local markets, and cotton, which is obtained from SOFITEX. There is limited exchange between farmers (neighbours and family), and NGOs play a small role in the seed supply. Only few people use improved seed, and apparently the largest exchange of seed takes place at the market.

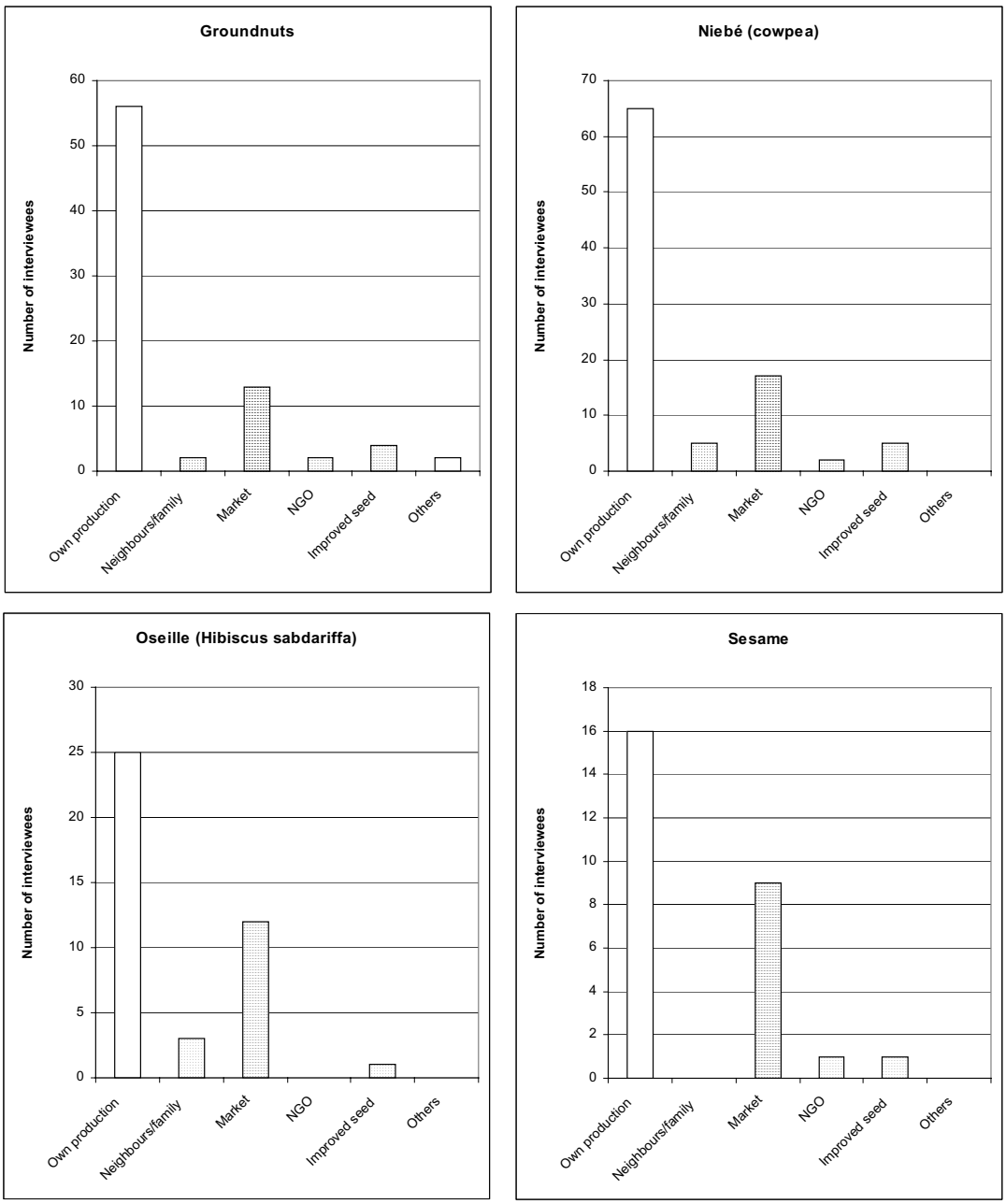


Figure 15. Farmer's indications of where they get their seed for ground nuts, niebé (cowpea), oseille (roselle, Hibiscus sabdariffa) and sesame. n=141. Farmers could indicate more than one source for each crop.
Figure 15. Les sources de semences des paysans pour l'arachide, le niébé, l'oseille et le sésame. Les catégories citées sont : production propre, voisins / famille, acheté au marché, ONG, semences améliorés et autres. n=141. Les paysans pourraient indiquer plus d'une source de semences pour chaque culture.

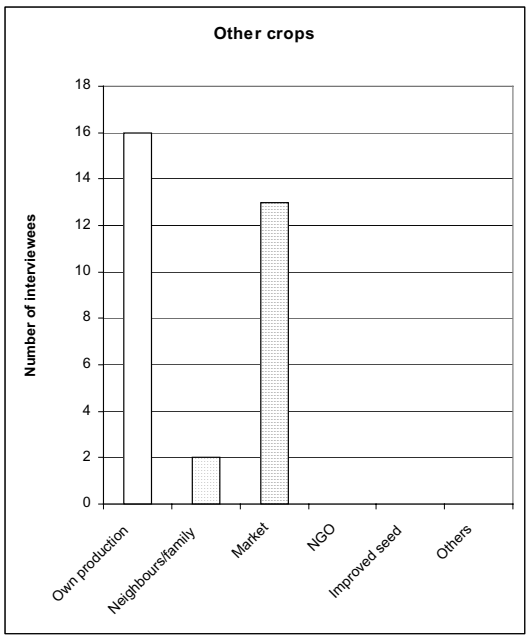


Figure 16. Farmer's indications of where they get their seed for minor, traditional crops. n=141. Farmers could indicate more than one source for each crop.

Figure 16. Les sources de semences des paysans pour les cultures mineures et traditionnelles. Les catégories citées sont : production propre, voisins / famille, acheté au marché, ONG, semences améliorés et autres. n=141. Les paysans pourraient indiquer plus d'une source de semences pour chaque culture.

5. Results from interviews in nurseries

General description of nurseries

15 of the 22 nurseries were privately owned, and the remaining seven belonged to different kinds of associations. Therefore 15 of the interviewees were owners, whereas the rest were managers. The principal activity of the interviewees was agriculture (indicated by 19 of the interviewees), but some were also involved in animal raising, commerce, vegetable growing and plantation activities (indicated by nine persons). The number working in the nursery varied from one to six persons with an average of three (an association saying that all 63 members worked in the nursery was excluded).

15 of the nurseries had received support for the establishment, whereas four had established the nurseries on their own initiative (three did not answer). At present, six received financial support or support with materials, whereas 15 were managing with own means (one did not answer). The majority of the nurseries were recent, being established within the last decade. However, several were established already in the eighties (Figure 17). One of the nurseries in Yacouta had not been working for over a year at the time of the interview, which is the reason why some of the questions have only 21 respondents.

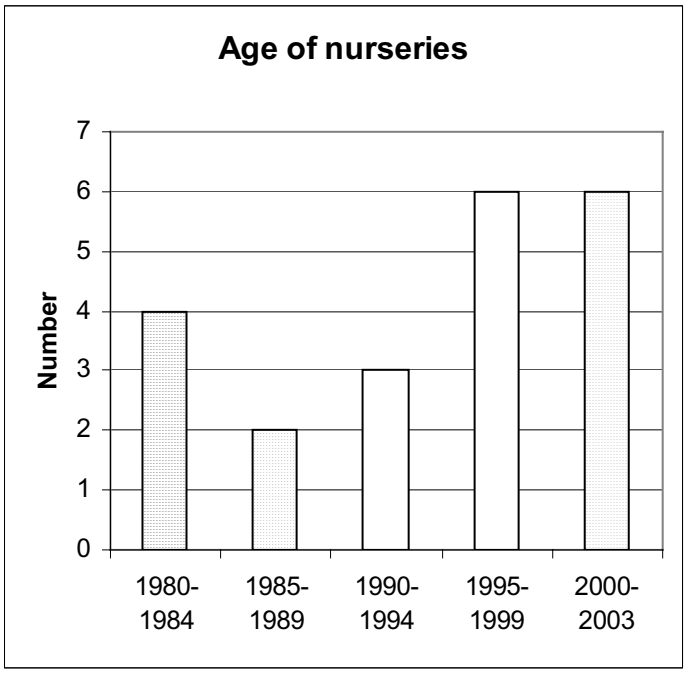


Figure 17. Year of establishment for the nurseries (n=21).
Figure 17. L'année d'installation des pépinières (n=21).

The species produced

There was a large variation in the number of species produced by the nurseries. The average number of species produced was six, but some produced only one and others as much as 13 species. There were no apparent differences in the number of species produced between the three regions (Fig. 18).
The nurseries produced in total 36 different species (see appendix 4). Many species were produced by only a single nursery. Exotic species were dominating, with the most frequently produced species being *Eucalyptus camaldulensis*, mango, cashew and *Senna siamea*, which are all introduced species. The most important local species were *Adansonia digitata*, *Parkia biglobosa* and *Ziziphus mauritiana* (Fig. 19).

The species produced varied slightly from zone to zone. For example, neem, *Prosopis juliflora* and the *Acacia* species were produced in the northern and central zones. On the other hand, cashew, *Senna siamea*, *Eucalyptus camaldulensis* and *Parkia biglobosa* were produced almost exclusively in the central and western zones (data not shown).

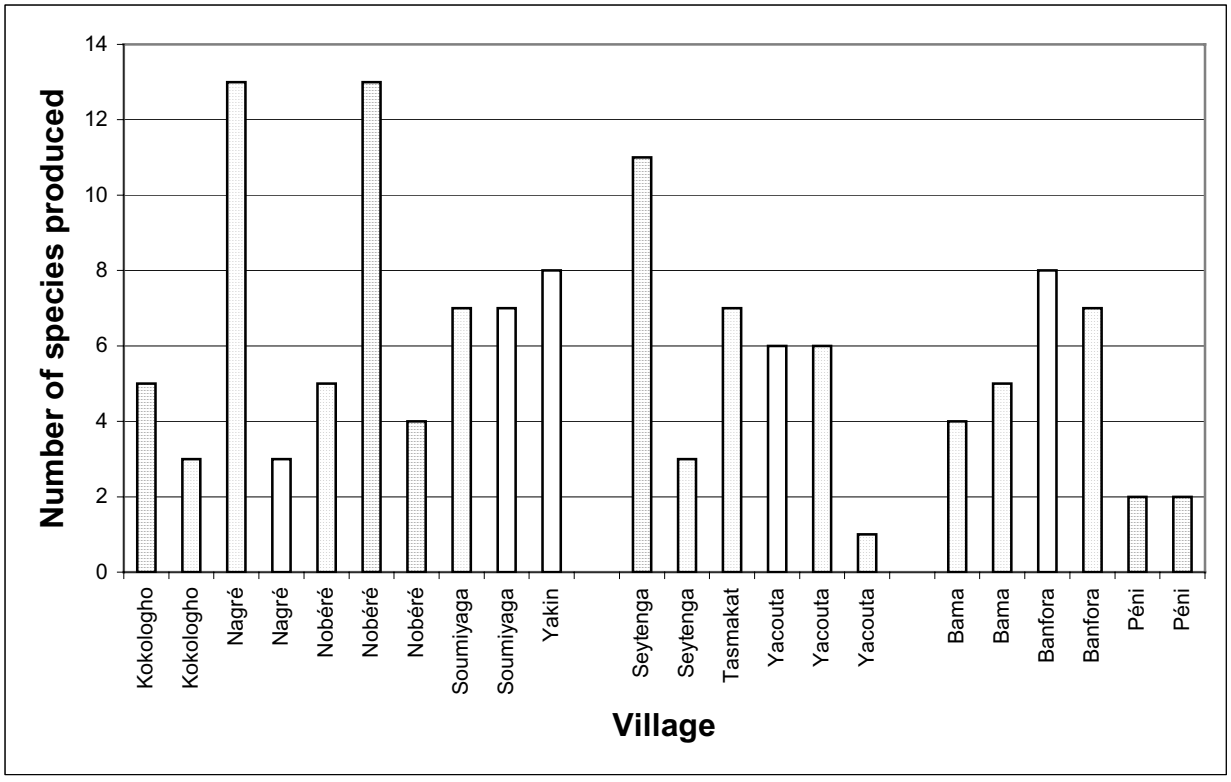


Figure 18. The number of species produced by each nursery in the three regions (Centre, North and South-west).
Figure 18. Le nombre d'espèces produites par chaque pépinière dans les trois régions (Centre, Nord et Ouest).

17 nurseries indicated that there were species they would like to produce, but that were not available to them. Most interviewees explained that this was due to lack of seed or reproductive material at the site (12 nurseries). Other reasons were lack of know-how (grafting of mango) and lack of water. The 23 species mentioned are listed in appendix 5. The species mentioned by most nurseries were *Citrus sp*. (five nurseries), *Terminalia mantaly* (four nurseries) and mango (three nurseries).

Sources of seed

The propagative material was almost exclusively seed. The only exceptions were one nursery owner who bought plants in Côte d'Ivoire, and two nurseries that produced grafted mangoes. The majority (58%) of the seed was collected, whereas 30% were bought and 12% were received as gifts (Fig. 20).

The bought seed was mainly obtained at local markets, either as seed or through buying fruits (especially mango and guava). However, one nursery in Nagré bought all their seed at the CNSF antenna in Fada N'Gourma, and two nurseries (at Nobéré and Yakin) bought seed from the forester in Manga. The gifts were mainly from JALDA (in the village of Yacouta) and from the CNSF antenna in Dori (Yacouta and Seytenga).

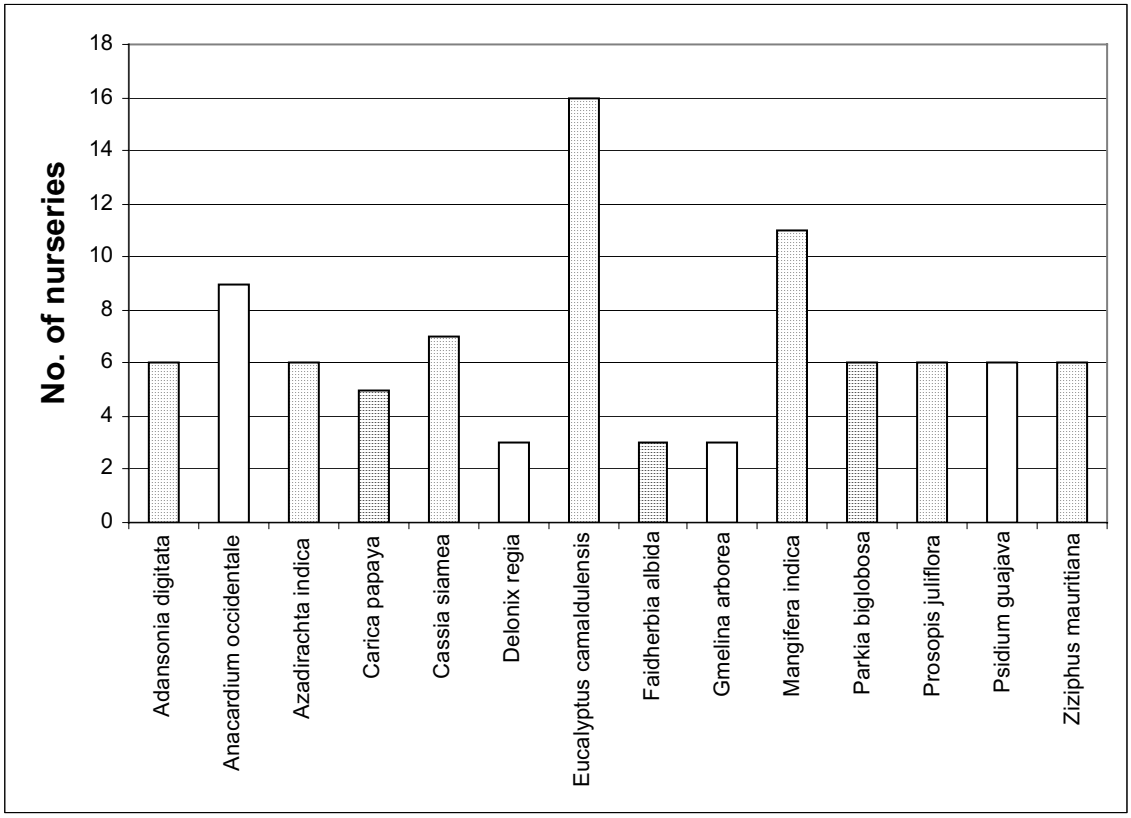


Figure 19. Species produced by at least three nurseries (a total list of the species produced is given in appendix 4).
Figure 19. Les espèces produites par au moins trois pépinières (voir la liste totale des espèces produites dans l'appendice 4)

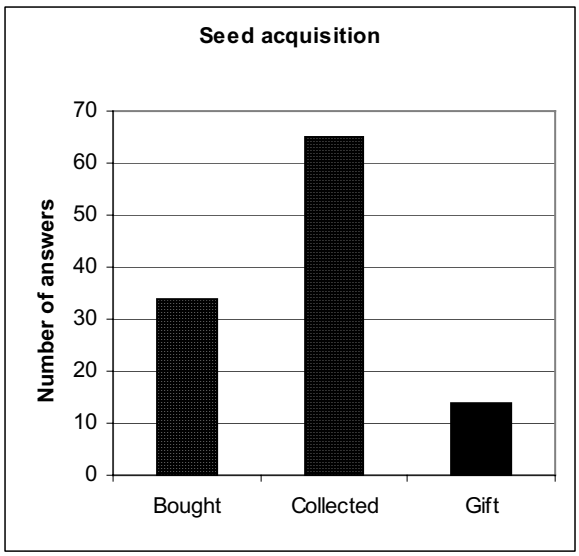


Figure 20. Nursery acquisition of seed (plants and grafts excluded). One answer for each species produced (n=22).
Figure 20. Les modes d'acquisition de semences pour les pépinières (les plants et les greffons sont exclus). Les catégories citées sont : acheté, collecté, et obtenu gratuitement. Une réponse pour chaque espèce produite. n=22.

Production and use of plants

One nursery (at Yacouta) had not produced plants during the last season, but the rest were able to inform on the number of plants produced. In total, the 21 nurseries produced 89,956 plants, giving an average production of 4,283 plants per nursery. The production was quite variable, ranging from 179 to 12,790 plants. Four nurseries produced more than 10,000 plants and accounted for approximately half of the total production.

Eucalyptus camaldulensis was dominating the production with more than 54,000 plants. The other species were produced in much smaller quantities, with *Acacia nilotica*, *Anacardium occidentale*, *Prosopis juliflora* and *Mangifera indica* as the leaders (3000-5000 plants each, see appendix 3).

The interviewees were asked who used the plants, but these questions could only partly be answered, and the sum up of the answers corresponded to 76,622 plants. Thus approximately 15% of the production is not accounted for. These data are presented in Fig. 21, and indicate that more than half of the production (almost 50,000 plants) was sold. The nursery owners and associations themselves used at least 11,000 plants, and approximately 13,000 had not yet been used. Only a limited proportion, corresponding to some 2500 plants, was given away to other villagers and, in two cases, the municipality.

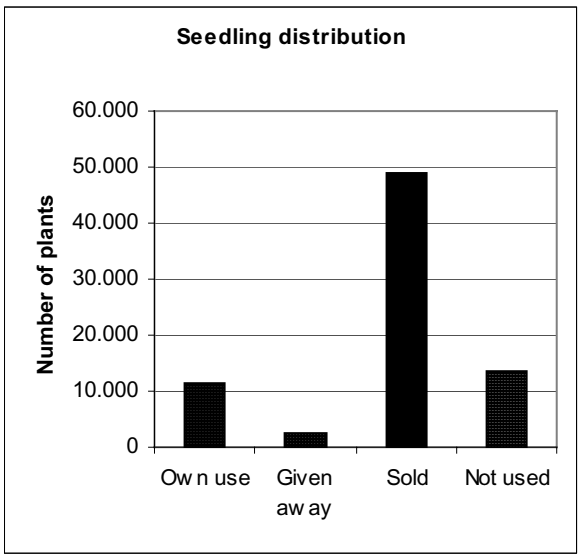


Figure 21. Distribution of plants produced in the nurseries (n=21). Note that 13,708 plants were not accounted for (see text).

Figure 21. La distribution des plants produits par les pépinières (n=21). Les catégories sont : utilisation propre, dons gratuits, vendu et non pas utilisé. Notez que 13708 plantes n'étaient pas pris en compte.

Price information was obtained from 15 of the nurseries. Prices were ranging from 50 F CFA for species used mainly for wood production to 1750 F CFA for a *Cocos nucifera* (see appendix 5 for average prices). In general, the highest prices were paid for fruit-bearing trees and shrubs. Prices were varying 2-3 times for the same species (e.g. *Senna siamea*, *Annona squamosa*, *Eucalyptus camaldulensis*) or even 5 times (*Adansonia digitata*). For *Mangifera indica*, the prices were varying from 50 to 500 F CFA, grafted plants being the most expensive. There are no clear trends in the prices between the different regions.

Inputs to the production

Most of the nurseries used plastic potting bags for the production. Only five to six nurseries used chemical fertiliser and pesticides. Other inputs mentioned were animal manure, compost and pots. The majority of inputs were either bought or collected. Only a few inputs were gifts, demonstrating that the nurseries largely operate independently (Table 7).

Table 7. Inputs to the production and their procurement.
Tableau 7. Les intrants pour la production des plants et leur mode d'acquisition.

	Plastic bags *(sacs plastiques)*	Chemical fertiliser *(engrais chimique)*	Pesticides *(pesticide)*	Other inputs *(autres intrants)*
Bought *(acheté)*	13	4	5	4
Collect *(collecté)*	4	0	0	7
Gift *(gratuit)*	3	1	1	2
Total	20	5	6	13

Constraints

The nurseries were experiencing four major types of constraints (see Fig. 22). Ten nurseries mentioned poor sale and low prices. However, technical problems such as lack of water, material and lack of protection from browsing animals were also important. All of these problems were mentioned by 9-13 nurseries.

Financial problems (probably related to poor market opportunities), lack of seed, lack of training and know-how, pathogens and lack of manpower were also mentioned, but only by few persons. The problems are thus diverse, and no one problem can be singled out as the most important.

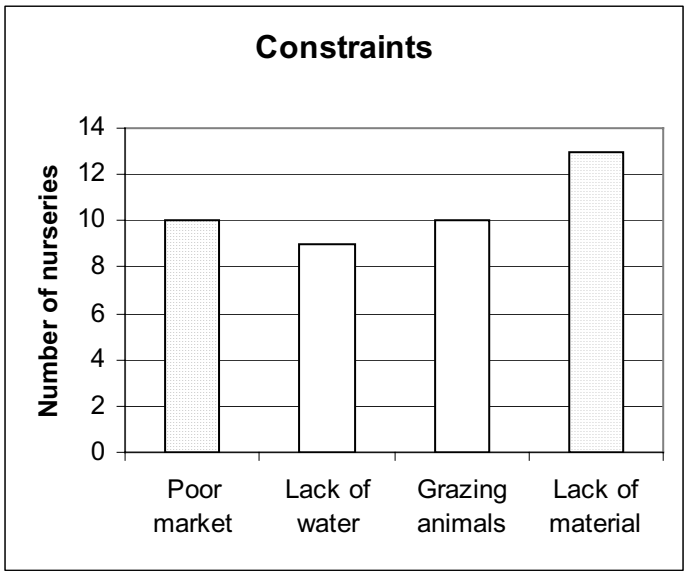


Figure 22. Major constraints experienced by the nurseries (n=22). Each nursery could indicate several types of constraints.

Figure 22. Les contraintes majeurs exprimées par les pépiniéristes. Les catégories cités sont : faible écoulement des plants, manque d'eau, divagation des animaux et manque de matériel. Chaque pépiniériste pourrait indiquer plusieurs types de contraintes.

Customers

According to the interviews, the most frequent type of customers were private (Fig. 23). All except three nurseries sold plants to this category. The NGOs came second with six nurseries, and three and two nurseries mentioned projects and the forestry service, respectively. The category 'others' (five nurseries) is comprised of different 'groupements' or farmers' associations, and of different kinds of state services.

However, even though projects and NGOs may not be important for all nurseries, eight of the nurseries said that their most important customers were projects, NGOs and farmers associations, while 11 said that the most important were private persons. Unfortunately it cannot be deducted from the data exactly who are the customers to the large quantities of *Eucalyptus camaldulensis*, but there are indications that both projects and individuals are involved.

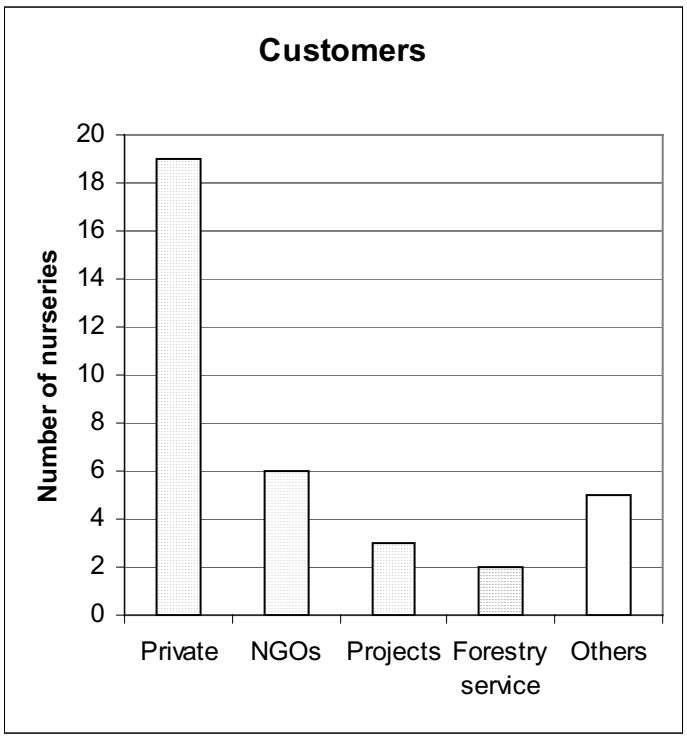


Figure 23. Customers to plants as indicated by the nurseries. Each nursery could indicate several types of customers. The customers were mainly local, from within a short distance of the nursery. All respondents answering the question (20) said that their customers were local, and only three said that they had customers coming from long distances (more than 20 km from the nursery).

Figure 23. Les clients acheteurs de plants comme indiqués par les pépinières. Chaque pépiniériste pourrait indiquer plusieurs types des clients. Les catégories cités sont : Privés, ONGs, projets, service forestière et autres.Les clients sont sur place, non loin de la pépinière. Touts les pépiniéristes ayant répondu à cette question (20) indiquaient que leurs clients étaient locaux, et seulement trois pépiniéristes indiquaient qu'il y avait des clients venant de loin (plus de 20 km de la pépinière).

Learning and contacts

During the interview, people were asked how they had learned how to produce plants (Fig. 24). Five persons had started by themselves, but the majority (17 persons) had had a course in nursery production. Only few persons had received information via radio and newspapers/journals. The category 'other' comprises a diversity of answers: A book in the library, other nurserymen, study-tours to other nurseries, and a campaign 'Better Nurseries'.

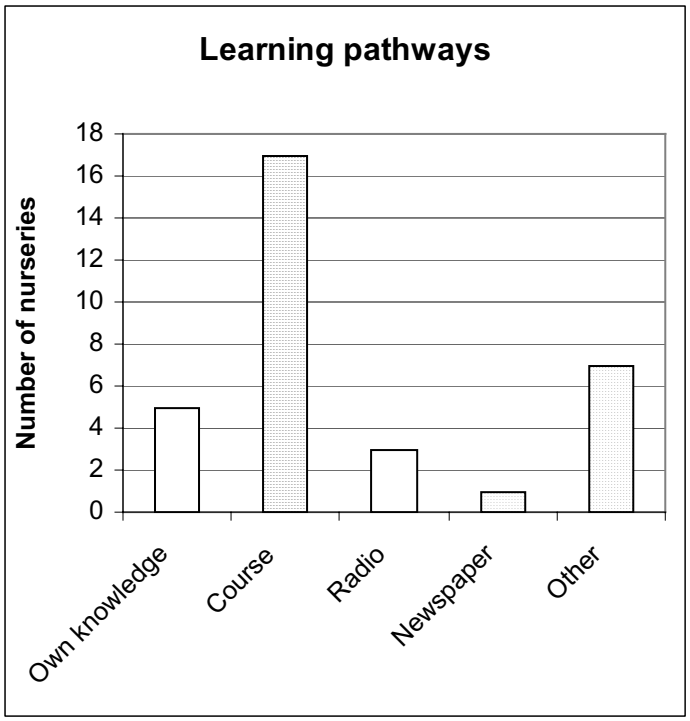


Figure 24. How nursery owners/managers have learned about nursery production (n=21). Each person could indicate several ways of learning.
Figure 24. Les voies d'apprentissage des pépiniéristes (n=21). Les catégories cités sont : savoir propre, formation, radio, journal, autres. Chaque pépiniériste pourrait indiquer plusieurs voies d'apprentissage.

15 of the interviewees said that they had contact with other nurseries or people producing plants. Many of the nurseries also had contacts to different kinds of organisations or services knowing about tree production (Fig. 25). 17 interviewees mentioned the Forestry Service, but the NGOs and the Agricultural Service were also important, mentioned by nine nurseries each. Eight nurseries mentioned CNSF as a contact, but it should be noted that some of the villages were selected because CNSF had been intervening and knew the villages. The category 'other' included projects, farmer's associations and SOFITEX.

Three people expressed no need for additional knowledge, but the rest mentioned different kinds of techniques that they would like to learn. The most frequent of these were grafting, especially of mango, which was mentioned by almost half of the nurseries (Fig. 26). However, some nurseries also expressed a need to learn more about conservation and pre-treatment of seed, and for various techniques related to the production of plants. The category 'other' contains the very general 'new techniques', maintenance of trees, direct sowing, phytopathology, production in earth containers, and plantation techniques.

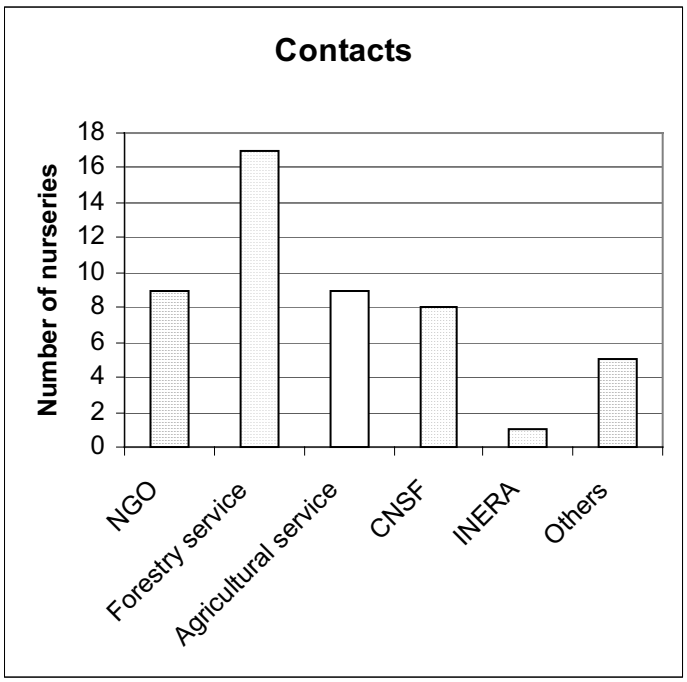


Figure 25. Nurseries contacts to organisations dealing with tree production. n=21.

Figure 25. Les contacts des pépinières avec les organisations travaillant dans le domaine de la production des arbres. Les catégories citées sont : les ONG, le service forestier, le service agricole, le CNSF, l'INERA, etc. n=21.

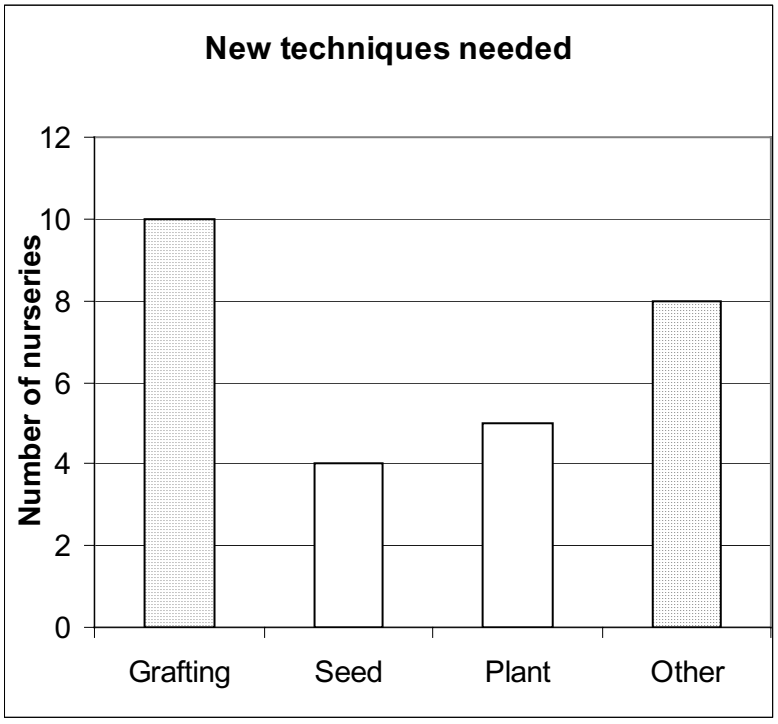


Figure 26. The need for additional knowledge as expressed by the interviewees. Three respondents expressed no need for additional knowledge (n=19).

Figure 26. Le besoin en connaissances supplémentaires, exprimé par les pépiniéristes. Les catégories citées sont : Greffage, traitement de semences, production des plants, et autres. Trois pépiniéristes exprimaient qu'ils n'avaient pas besoin des connaissances supplémentaires.

6. Discussion and conclusions

Although the survey has limitations, it does point to some major important patterns in farmers' use of reproductive material and of the organisation of nurseries in Burkina Faso.

Farmers' tree seed/seedling use

The survey showed that there is a large and ongoing planting activity in the country by farmers. Almost nine of ten farmers had planted trees, and more than half of them had planted recently. There are regional differences in the number of species planted by farmers, with more species being planted in the drier areas. A few exotic species dominate, but there is a demand for local trees as well. Apart from *Eucalyptus camaldulensis*, fruit trees are in high demand. Seed and seedling availability is a constraint for the use of more species, but elevated prices and a number of technical/practical problems were also cited as constraints for an increased use of trees.

The large part of the planting material is bought (in particular grafts), while the rest is collected or received for free. A majority of NGOs seems to give away planting material for free.

Nurseries

There were nurseries in 10 out of the 12 villages in the survey. Assuming that Burkina Faso has 8000 villages and that the selected villages are representative, the annual production of seedlings in village nurseries in Burkina Faso would amount to 40-60 millions plants. Although this is a very rough estimate, we believe that the order of scale is correct – the plants produced should be counted in tens of millions instead of in millions.

A large proportion of nurseries is privately owned and a large proportion of seed is sold; only a very limited proportion was given away to other villagers. The customers were mainly private people. Individual nurseries produce relatively few species, but differences between nurseries leads to relatively many species produced in total. Exotic species dominate (Eucalyptus, fruits and ornamentals), but local fruit species are also produced.

The species produced vary slightly from zone to zone. Seed availability appears to be a constraint for the use of more species. Nursery owners collected the majority of the seed, a substantial proportion was bought and less was received as gifts. A large proportion of nursery owners has received training in nursery production, and a large proportion is in contact with other nurseries or people producing plants. Several of the nurseries had existed for more than a decade.

Farmers' agricultural seed use

Only few people use improved seed, and apparently the largest exchange of seed takes place at the market. There is relatively limited exchange between farmers (neighbours and family), and NGOs play a small role in the seed supply. Most crops are based on seed from farmer's own selection and production. The exceptions are horticultural seed (in particular vegetables), which is obtained at the market, and cotton, which is obtained from SOFITEX.

Apart from showing that distribution of improved cereal seed is facing serious difficulties, the results demonstrate that alternative pathways for tree seed distribution could be found by linking up either with SOFITEX or with horticultural seed dealers.

Further work on seed systems

The findings from the survey support Tripp's general characteristics of the agricultural seed sector in Africa (Tripp 2001, see the introductory chapter), and that the general characteristics also apply to the tree seed sector. One of the major implications of the study is that the demand for planting material of trees and fruit trees in Burkina Faso is sufficiently high to have created a fledgling commercial production of tree seed and seedlings. The market for tree seed and seedlings does, however, not appear to be supported by any institutions in the country. In fact many NGOs appear to be undermining market development by free handouts of planting material.

There are no indications that farmers and nursery owners are supported institutionally in obtaining the best possible planting material in terms of genetic quality and growth potential – rather, the farmers and nursery owners mostly collect what is available both with respect to species and genetic quality.

A large proportion of nurseries are privately owned – indicating that there is a large number of entrepreneurs in Burkina Faso in the tree seed and seedling business. These entrepreneurs could be an important pathway for production and distribution of seed and information – with suitable institutional support.

Farmers' use of crop seed also appears to be largely unsupported institutionally and commercially, except for specific crops such as cotton and vegetable seed. There appears to be a rich opportunity for improving seed production and distribution systems both with respect to improving the institutional support to commercial development and with respect to the genetic quality and diversity of species on offer to farmers.

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Appendix 1. Questionnaire used for interviews of farmers

Nursery managers were interviewed according to a similar questionnaire, but modified to include questions on customers, plant production etc.

Appendice 1. Questionnaire pour les entretiens avec les paysans et les grands planteurs. Pour les pépinières, les questions étaient légèrement modifiées pour prendre en compte leurs conditions spécifiques.

Producteurs et planteurs (questionnaire diagnostic ISSAAC Burkina Faso) Enquêteur :_____ Fiche no. _____

Producteurs (12) ❑

Grand planteur ❑

Introduction: Ce questionnaire est fait pour déterminer les besoins et les priorités en relation de semences forestières et plantules et le réseau de distribution de semences. Entretiens avec paysans dans tout Burkina Faso seront entreprises pour savoir leur implication dans la distribution de semences

1. **Date** _____ **2002**
2. **Nom de paysan** _____

2.a : Ethnie _____

3. Province _____
4. Département_____
5. Village _____
6. Propriétaire des terres_____
7. Activité principale : 1. Agriculture ? 2. Elevage ? 3. Commerce ? 4. Autre : _____
8. Surface des terres de paysan: cultivé _____, plantation_____ (no. d'arbres, espèce : _____), jachère _____
9. Le matériel agricole utilisé : 1. Houe 2. Charrue 3. Tracteur 4. Autre

10. Est-ce vous avez jamais planté ou semé des arbres ? _____
11. Est-ce vous avez planté ou semé des arbres récemment ? _____
12. Les espèces forestières et fruitières plantées ou semeés par le paysan, leur origine et utilisation

Espèce	Est-ce que vous utilisez semenc-es, greffes ou plantules ?	Où avez vous obtenu les semences / plantules ?	Prix (achat, don, coll.) ?	Si collectés : Origine des semences	Pourquoi est-ce que vous collectez ces semences ?	Est-ce que vous pro-duisez vos propres plantules ?	Qu'est-ce qui ce passe avec les semences et / ou les plantules ?		
							Propre util.	Cadeau libre (qui)	Vente (prix /qui)

13. Quelles sont les intrants que vous utilisez pour la production ?

Sachets plastiques ? Où :_____ Achat ? Don ?
Engrais chimique ? Où :_____ Achat ? Don ?
Pesticides ? Où :_____ Achat ? Don ?

Autre : _____ Où : _____ Achat ? Don ?

14. Quels sont les problèmes que vous avez pour obtenir et utiliser semences (forestières et fruitières) ? (souligne le plus important)

_____

_____

15. Quels sont les problèmes que vous avez pour obtenir et utiliser plantes (forestières et fruitières) ? (souligne le plus important)

_____

_____

16. Quelles espèces (forestières et fruitières) aimeriez vous avoir dans votre champs qui ne sont pas disponibles: ?

Espèce	Pourquoi est-ce qu'ils ne sont pas disponibles ?	Pourquoi aimeriez-vous cette espèce ?

17. Avez-vous contact avec autres paysans qui font la collecte de semences ou qui produise plantes (forestières et fruitières) ?

Oui ❑, Non ❑. Si oui, avec qui, expliquez comment ca vous aide ? _____

18. Avez-vous contact avec organisations qui s'occupe de semences et plantes forestières et fruitières ?

1. ONG ❑, 2. Service forestière ❑, 3. Service agricole ❑, 4. CNSF ❑ 5. INERA ❑

5. autres_____

19. Ou avez-vous appris semer / planter : 1. connaissance propre ❑

2. formation formelle (où)_____ 3. radio ❑ 4. journal ❑
5. autres _____

20. Quelles sont les semences agricoles/maraîchage que vous utilisez et d'ou viennent-ils ?

	Espèces :
Propre production	
Voisins, famille	
Acheté marché	
ONG	
Semences améliorées (où) ?	
Autres :	

21. D'où viennent les intrants agricoles que vous utilisez (engrais chimique, pesticides) ? _____
_____

22. Avez-vous des questions ou des commentaires ?

23. Autres observations par l'enquêteur ?

REMERCIER LE PAYSAN pour son temps et collaboration !
Coordonnées GPS

Appendix 2. Species planted by farmers

Data indicates the number of farmers planting the species, and the number of villages where the species are planted. Note that in the centre, interviews were conducted in 6 villages, whereas they were conducted in three villages each in the North and West. The total number of farmers was 144.
Appendice 2. Les espèces plantées par les paysans.
Les chiffres indiquent le nombre de paysans qui plantent l'espèce, et le nombre de villages ou les espèces sont plantées. Notez que dans la zone du Centre, les entretiens ont eu lieu dans 6 villages, mais qu'au Nord et à l'Ouest, seulement 3 villages ont été concernés par l'enquête. Le nombre total de paysans était de 144.

	Number of farmers				**Number of villages**			
	Centre	North	West	Total	Centre	North	West	Total
Acacia nilotica	5	5		10	4	2		6
Acacia pennata	1			1	1			1
Acacia raddiana		2		2		1		1
Acacia senegal	2	4		6	2	2		4
Acacia seyal		4		4		2		2
Adansonia digitata	4	1		5	2	1		3
Anacardium occidentale	4		19	23	1		3	4
Annona squamosa	1			1	1			1
Azadirachta indica	25	4		29	5	1		6
Balanites aegyptiaca		8		8		3		3
Bauhinia rufescens		3		3		3		3
Borassus aethiopum		2		2		1		1
Cania*	2			2	1			1
Carica papaya	3		1	4	1		1	2
Citrus limon		3	5	8		2	3	5
Citrus sinensis			1	1			1	1
Combretum		1		1		1		1
Crescentia cujete		1		1		1		1
Delonix regia	1			1	1			1
Diospyros mespiliformis		2		2		2		2
Eucalyptus camaldulensis	47	2	4	53	6	2	1	9
Faidherbia albida	3	13		16	3	3		6
Gmelina arborea	1		1	2	1		1	2
Grewia bicolor		1		1		1		1
Jatropha curcas	1			1	1			1
Khaya senegalensis	1			1	1			1
Loukouri*		1		1		1		1
Mangifera indica	46	4	25	75	6	2	3	11

	Number of farmers				Number of villages			
	Centre	North	West	Total	Centre	North	West	Total
Parkia biglobosa	6		2	8	3		1	4
Piliostigma reticulata		3		3		2		2
Prosopis juliflora		4		4		2		2
Psidium guajava	10	4		14	4	3		7
Sclerocarya birrea		2		2		1		1
Senna siamea	15			15	5			5
Tamarindus indica		1		1		1		1
Tectona grandis	2		2	4	2		1	3
Ziziphus mauritiana	1	8		9	1	3		4
Unknown	1				1			1

*Where the species could not be identified, local names are used.

Appendix 3. Trees species that were wanted, but not available to farmers and big tree planters

Data indicates the number of farmers (or big tree planters) that wanted the species. n=144 (farmers), n=24 (big tree planters).

Appendice 3. Les espèces désirées mais non disponibles pour les paysans et les grands planteurs. Les chiffres indiquent le nombre de paysans (ou grands planteurs) qui ont désiré l'espèce. n=144 (paysans), n=24 (grands planteurs).

Farmers		Big tree planters	
Acacia nilotica	7	Afzelia africana	1
Acacia senegal	4	Anacardium occidentale	3
Acacia seyal	1	Bauhinia rufescens	1
Adansonia digitata	6	Bombax costatum	1
Afzelia africana	1	Carica papaya	1
Anacardium occidentale	18	Citrus limon	1
Avocatier	3	Citrus sinensis	1
Azadirachta indica	3	Detarium microcarpum	1
Balanites aegyptiaca	1	Eucalyptus camaldulensis	1
Bauhinia rufescens	1	Faidherbia albida	1
Bombax costatum	1	Gmelina arborea	1
Carica papaya	4	Mangifera indica	5
Ceiba pentandra	1	Parkia biglobosa	4
Citrus limon	9	Phoenix dactylifera	1
Citrus reticulata	2	Prosopis juliflora	1
Citrus sinensis	17	Psidium guajava	1
Cocos nucifera	2	Tectona grandis	2
Cola nitida	2	Terminalia mantaly	2
Detarium microcarpum	2	Vitellaria paradoxa	3
Eucalyptus camaldulensis	23		
Faidherbia albida	7		
Khaya senegalensis	2		
Lannea microcarpa	3		
Mangifera indica	44		
Musa sp	1		
Parkia biglobosa	31		
Prosopis juliflora	2		
Psidium guajava	18		
Senna siamea	2		
Tamarindus indica	1		
Tectona grandis	1		
Vernonia amygdalina	1		
Vitellaria paradoxa	12		
Ximenia americana	2		
Ziziphus mauritiana	6		

Appendix 4. Species and seedlings produced by the nurseries

A single nursery gave no information, thus n=21.
Appendice 4. Les espèces et les plantules produites par les pépinières.
Une pépinière n'a pas donné de réponse, donc n=21.

Species	No. of nurseries	Centre	North	West	Total
Acacia nilotica	7	4050	600		4650
Acacia raddiana	2		100		100
Acacia senegal	4	200	2340		2540
Acacia seyal	1		1000		1000
Adansonia digitata	6	340	150	350	840
Anacardium occidentale	9	292		3900	4192
Annona squamosa	2	500		100	600
Argyrea tilifolia	1		200		200
Azadirachta indica	6	900	800		1700
Balanites aegyptiaca	1				
Bauhinia rufescens	2		85		85
Bombax costatum	1				
Borassus aegyptiaca	1	70			70
Carica Papaya	5	490	110		600
Citrus limon	1			300	300
Cocos nucifera	1			200	200
Cola nitida	1				
Delonix regia	3	100		1000	1100
Detarium microcarpum	2	100			100
Eucalyptus camaldulensis	16	21025	20	33000	54045
Faidherbia albida	3	150	500		650
Gmelina arborea	3	20		1000	1020
Khaya senegalensis	2	1600		100	1700
Mangifera indica	12	3022	210	200	3432
Moringa oleifera	1	3			3
Parkia biglobosa	6	1490		200	1690
Persea americana	1	32			32
Phoenix reclinata	1			300	300
Prosopis juliflora	6	2240	1600		3840
Psidium guajava	6	1352	150		1502
Senna siamea	7	950		700	1650
Tectona grandis	1	15			15
Thevetia neriifolia	1			200	200
Vitellaria paradoxa	2			300	300
Ziziphus mauritiana	6	250	600	250	1100
Not identified	1		200		200

Appendix 5. Species identified by the 21 nurseries as 'wanted, but not available'

Appendice 5. Les espèces identifiées comme désirées mais non disponibles par les 21 pépinières.

Species	No. of nurseries
Bombax costatum	1
Carica papaya	1
Casuarina equisitifolia	1
Citrus limon	3
Citrus reticulata	1
Citrus sinensis	1
Cocos nucifera	1
Delonix regia	1
Elaeis guineensis	1
Khaya senegalensis	2
Lannea microcarpa	1
Leucaena leucocephala	1
Mangifera indica	3
Parkia biglobosa	2
Phoenix reclinata	1
Psidium guajava	2
Terminalia catappa	1
Terminalia mantaly	4
Vitellaria paradoxa	2
Vitex doniana	1
Ximenia americana	1
Naglega (not identified, local name)	1
Ornamental plants (species not specified)	2

Appendix 6. Average prices in F CFA of plants produced

Data from 15 nurseries. 100 F CFA equalled ca. 0.15 Euro (March 2004).

Species	Centre	North	West	Total
Acacia nilotica	50			50
Acacia raddiana				
Acacia senegal	50	60		55
Acacia seyal				
Adansonia digitata	100	75	175	117
Anacardium occidentale			100	100
Annona squamosa	100		300	200
Argyrea titifolia				
Avocatier				
Azadirachta indica	200	63		131
Balanites aegyptiaca				
Bauhinia rufescens				
Bombax costatum				
Borassus aegyptiaca				
Carica Papaya	50	150		100
Citrus limon				
Cocos nucifera			1750	1750
Cola nitida				
Delonix regia	50		100	75
Detarium microcarpum				
Eucalyptus camaldulensis	60		80	70
Faidherbia albida				
Gmelina arborea			100	100
Khaya senegalensis				
Mangifera indica	254	200	75	225
Moringa oleifera				
Parkia biglobosa	67		75	69
Phoenix reclinata			750	750
Prosopis juliflora	100			100
Psidium guajava	69	100		79
Senna siamea	88			88
Tectona grandis	50			50
Thevetia neriifolia				
Vitellaria paradoxa			75	75
Ziziphus mauritiana			100	100
Not identified		100		100
Global average	115	98	224	149

Forest & Landscape Working Papers

No. 1 • 2004 Experiences with web-based teaching in forestry
No. 2 • 2004 Distribution of tree seed and seedlings
No. 3 • 2004 Identifying forest-livelihood research priorities in Mozambique
No. 4 • 2004 Breeding for die-back resistant Dalbergia sissoo in Nepal
No. 5 • 2004 Farmers' planting practices in Burkina Faso